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Screen-based sedentary behaviours among a nationally representative sample of youth: are Canadian kids couch potatoes?

S. T. Leatherdale, PhD (1); R. Ahmed, PhD (1,2)

This article has been peer reviewed.

Abstract

Purpose: To determine the percentage of Canadian youth meeting screen-time guidelines and to identify characteristics associated with different screen-time behaviours.

Methods: Using nationally representative data collected from the 2008/2009 Youth Smoking Survey (YSS), we analyzed three screen-time behaviours, cigarette smoking, weekly spending money, self esteem, region and grade by sex, and conducted four logistic regression models to examine factors associated with more than 2 hours a day of sedentary screen time.

Results: Of 51 922 Canadian youth in grades 6 to 12, 50.9% spent more than 2 hours per day in screen-based behaviours. The average daily screen time was 7.8 (± 2.3) hours. Males and current smokers were more likely to report over 2 hours per day watching TV and videos or playing video games, whereas students in higher grades and those with weekly spending money were more likely to report playing or surfing on a computer. Youth with higher self-esteem were less likely to report spending over 2 hours per day in each of the three screen-time behaviours examined.

Conclusion: Developing a better understanding of the factors associated with more hours of screen time is required to develop and target interventions that reduce screen-time behaviours.

Keywords: sedentary behaviour, youth/child, screen time, Youth Smoking Survey, tobacco, surveillance, self esteem

Introduction

Screen-based sedentary behaviours likely have a negative impact on many different aspects of youth health and development.[1,2] For instance, the increasing trend in youth obesity in North America coincides with an increasing prevalence of youth reporting over 3 hours of screen time per day.[3] The American Academy of Pediatrics[4] has developed guidelines that recommend limiting children's total entertainment screen time to no more than 1 to 2 hours of quality programming per day. Considering that few Canadian youth currently meet these recommendations,[5,6] activities designed to reduce sedentary screen time among youth should be a public health priority.

A substantial body of research has examined characteristics associated with watching television (TV).[5,6,8] More recently, other types of sedentary screen-time behaviours have also garnered attention, for example, playing video games and using computers.[5,6,8] It seems that youth are more likely to spend time in these types of screen-based behaviours if they are male,[5,6,9-11] older,[5,9,11] from a low income family[9] or if they engage in risk behaviours such as smoking.[12] Given that this is also a developmental period when youth's self-esteem is associated with the likelihood of their engaging in health-promoting or inhibiting behaviours,[13] it is important to determine if screen time is associated with self-esteem. Considering that excessive screen time is associated with an increased risk of obesity[1,3] and engaging in other risk behaviours,[5] a better understanding of different screen-time behaviours would provide valuable insight for targeting or tailoring interventions to prevent or reduce screen time among youth populations.

The purpose of our study was to determine the percentage of Canadian youth who exceed the recommended screen time guideline and to identify characteristics associated with different screen-time behaviours.

Methods

Our study used nationally representative data collected from 51 922 students in grades 6 to 12 as part of the 2008/2009 Canadian Youth Smoking Survey (YSS).[14] In brief, the target population for this study consisted of all young Canadian residents in grades 6 to 12 attending public and private secondary schools in 10 Canadian provinces. The YSS was administered to students during class time, and participants were not compensated. To reduce demands on schools and to increase student participation rates, the YSS used active information with passive consent.

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The YSS asked respondents to report the average number of hours per day that they spent (a) watching TV or videos,* (b) playing video games and (c) playing games or surfing the Internet on a computer. Respondents could choose from "none," "less than 1 hour a day," "1 to 2 hours a day," "more than 2 hours a day but less than 5 hours a day," or "5 or more hours a day" for each behaviour. Consistent with existing research[8,15] and guidelines,[4] we grouped responses for each construct into two categories (≤ 2 hours/day, > 2 hours/day) for each individual activity and for the total screen time. We calculated a conservative estimate of the mean screen time per day based on the lowest value of each response category reported. The YSS also collected information on demographics, cigarette smoking behaviour, weekly spending money and self-esteem. Specific details on these measures are available elsewhere.[†]

We examined descriptive analyses of our three sedentary behaviour constructs as well as cigarette smoking behaviour, weekly spending money, self-esteem, region and grade by sex. We then conducted four logistic regression models to examine factors associated with watching TV or videos, playing video games, and playing or surfing on a computer for more than 2 hours a day per each behaviour as well as total screen time for more than 2 hours a day. Survey weights for descriptive statistics were used to adjust for differential response rates across regions or groups; the statistical package SAS version 8.02 was used for all analyses.[16]

Results

Respondent characteristics

The study sample was 48.7% male and 51.3% female, representing 1 388 139 boys and 1 460 341 girls. Among students in grades 6 to 12, 30.2% (n = 836 518) rep-orted watching over 2 hours of TV or videos per day (mean 3.0 ± 0.9 h/d); 13.7% (n = 372 132) reported playing video games for over 2 hours per day (mean 2.1 ± 1.1 h/d) and 29.9% (n = 814 116) reported playing or surfing on a computer for over 2 hours per day (mean 2.9 ± 1.1 h/d). Overall, 50.9% (n = 1 439 311) of Canadian youth spent over 2 hours per day on total screen time (Table 1).

TABLE 1
Descriptive statistics for youth in the Youth Smoking Survey by sex, 2008/2009, Canada

		Youth		
		Male (n = 1 388 139) %[a]	Female (n = 1 460 341) %[a]	Total (n = 2 848 480) %[a]
Grade				
6		13.1	13.6	13.3
7		13.8	14.2	14.0
8		14.3	14.5	14.4
9		14.9	14.8	14.8
10		15.5	14.8	15.2
11		14.9	14.7	14.8
12		13.5	13.4	13.5
Smoking status				
Never smoker		90.1	92.5	91.3
Current smoker		8.9	6.4	7.7
Former smoker		1.0	1.1	1.0
Weekly spending money, $				
0		21.9	19.0	20.5
1–20		38.4	41.4	39.8
21–100		24.1	27.1	25.6
> 100		15.6	12.5	14.1
Self-esteem *(derived score from 0 to 12)*				
0–4		1.8	3.3	2.6
5–8		23.3	38.4	30.6
9		16.2	17.2	16.7
10		20.6	16.4	18.6
11		22.5	15.3	19.0
12		15.6	9.4	12.5
Region				
Atlantic Canada[b]		6.7	7.2	6.9
Quebec		19.3	19.4	19.4
Ontario		41.4	40.5	40.9
Prairies[c]		18.8	19.0	18.9
British Columbia		13.8	13.9	13.9
Screen-time behaviour (average h/d)				
Watching TV or videos[d]	≤ 2	68.8	70.8	69.8
	> 2	31.2	29.2	30.2
Playing video games	≤ 2	76.6	96.6	86.3
	> 2	23.4	3.4	13.7
Playing/surfing on a computer	≤ 2	71.7	68.3	70.1
	> 2	28.3	31.4	29.9
Total screen time (all behaviours)	≤ 2	46.4	52.0	49.1
	> 2	53.6	48.0	50.9

Abbreviations: CI, confidence interval; d, day; h, hour; n, sample size.

[a] Weighted population estimate.

[b] New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador.

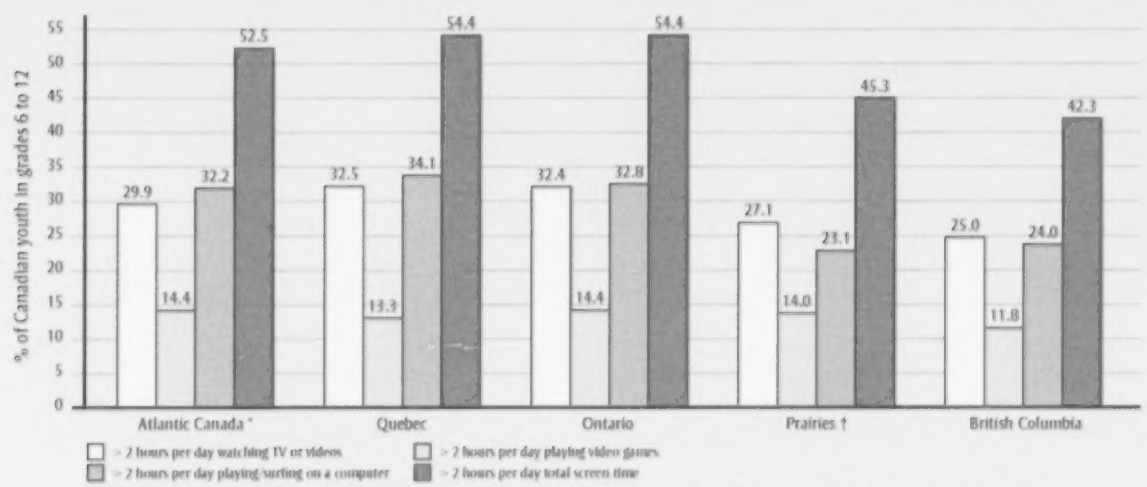
[c] Alberta, Saskatchewan, Manitoba.

[d] "Videos" refers to TV series or movies watched at home, on video tape, DVD or Blu-ray.

* Video time refers to TV series or movies watched at home, on video tape, DVD or Blu-ray. In our preliminary research validating the comprehension of these measures with youth populations, the youth we sampled interpreted the term "video" to refer to any type of movie or TV series watched at home.

† www.yss.uwaterloo.ca

FIGURE 1
Prevalence of sedentary behaviours by region, Canada, 2008/2009



Source: 2008 2009 Canadian Youth Smoking Survey. * New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador. † Alberta, Saskatchewan, Manitoba.

TABLE 2
Logistic regression analyses examining characteristics associated with screen-time behaviours among youth (grades 6 to 12) in the Youth Smoking Survey, 2008/2009, Canada

Characteristic	Screen-time behaviour, adjusted OR[a] (95% CI) (n = 51 922)			
	Watching TV or videos[b] *> 2h/d vs. ≤ 2 h/d*[c]	Playing video games *> 2h/d vs. ≤ 2 h/d*[d]	Playing/surfing on a computer *> 2h/d vs. ≤ 2 h/d*[e]	Total screen time *> 2h/d vs. ≤ 2 h/d*[f]
Sex				
Female	1.00	1.00	1.00	1.00
Male	1.16 (1.12–1.22)***	10.18 (9.41–11.01)***	1.00 (0.97–1.04)	1.46 (1.41–1.52)
Grade				
6	1.00	1.00	1.00	1.00
7	1.01 (0.94–1.09)	1.14 (1.02–1.28)*	1.38 (1.26–1.51)***	1.16 (1.08–1.25)***
8	0.99 (0.91–1.07)	1.47 (1.32–1.63)***	1.88 (1.73–2.05)***	1.46 (1.36–1.57)***
9	0.83 (0.77–0.90)***	1.20 (1.07–1.34)**	1.94 (1.78–2.11)***	1.32 (1.22–1.42)***
10	0.82 (0.76–0.89)***	0.99 (0.89–1.11)	1.86 (1.71–2.03)***	1.18 (1.09–1.27)***
11	0.65 (0.59–0.70)***	0.88 (0.78–0.99)*	1.77 (1.62–1.94)***	1.10 (1.02–1.19)*
12	0.71 (0.65–0.77)***	0.59 (0.52–0.68)***	1.80 (1.64–1.98)***	1.09 (1.01–1.18)*
Smoking status				
Never smoker	1.00	1.00	1.00	1.00
Current smoker	1.15 (1.06–1.24)***	1.23 (1.10–1.37)***	1.00 (0.92–1.09)	0.99 (0.92–1.07)
Former smoker	1.27 (1.01–1.58)*	1.26 (0.92–1.72)	0.61 (0.47–0.78)***	0.89 (0.72–1.09)
Weekly spending money, $				
0	1.00	1.00	1.00	1.00
1–20	0.88 (0.84–0.93)***	0.86 (0.80–0.93)***	1.06 (1.00–1.12)*	0.95 (0.90–0.99)*
21–100	0.89 (0.84–0.93)***	0.81 (0.74–0.88)***	1.14 (1.07–1.22)***	0.97 (0.91–1.02)
> 100	0.81 (0.75–0.88)***	0.98 (0.88–1.09)	0.99 (0.91–1.07)	0.80 (0.74–0.86)***
Self-esteem, each 1 unit increase	0.91 (0.90–0.92)***	0.88 (0.87–0.90)***	0.85 (0.84–0.86)***	0.85 (0.84–0.86)***

Abbreviations: CI, confidence interval; d, day; h, hour; n, sample size; OR, odds ratio.

[a] Odds ratios controlling for region and adjusted for all other variables in the table.

[b] "Videos" refers to TV series or movies watched at home, on video tape, DVD or Blu-ray.

[c] 1 is the equivalent of > 2 hours watching TV or videos per day (n = 12 671), 0 is the equivalent of ≤ 2 hours watching TV or videos per day (n = 30 838).

[d] 1 is the equivalent of > 2 hours playing video games per day (n = 5818), 0 is the equivalent of ≤ 2 hours playing video games per day (n = 36 724).

[e] 1 is the equivalent of > 2 hours playing/surfing on a computer per day (n = 12 375), 0 is the equivalent of ≤ 2 hours playing/surfing on a computer per day (n = 30 298).

[f] 1 is the equivalent of > 2 hours total screen time per day (n = 22 123), 0 is the equivalent of ≤ 2 hours total screen time per day (n = 22 415).

* p < .05 ** p < .01 *** p < .001

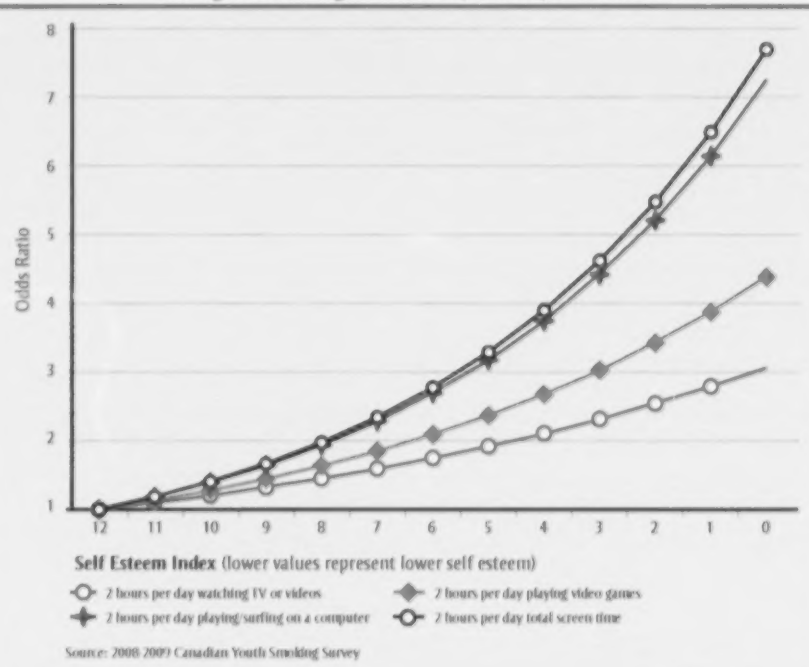
Boys were more likely than girls to report spending over 2 hours per day watching TV or videos ($\chi^2 = 23.3$; $df = 1$; $p < .001$) and playing video games ($\chi^2 = 4164.0$; $df = 1$; $p < .001$), whereas girls were more likely than boys to report spending over 2 hours per day playing or surfing on a computer ($\chi^2 = 66.2$; $df = 1$; $p < .001$). Boys were also more likely than girls to spend over 2 hours per day in total screen time ($\chi^2 = 158.6$; $df = 1$; $p < .001$). Overall, students spent an average of 7.8 (± 2.3) hours per day in these three sedentary activities (boys 8.3 ± 2.5 h/d; girls 7.3 ± 2.1 h/d).

The prevalence of sedentary behaviours across regions varied substantially (see Figure 1). For instance, the prevalence of students reporting watching over 2 hours of TV or videos per day or playing or surfing on a computer was substantially lower in the Prairies and British Columbia than in the rest of Canada. Conversely, the prevalence of students reporting watching over 2 hours of total screen time per day was highest in Quebec and Ontario.

Watching TV or videos. Compared to never smokers, both current smokers and former smokers were more likely to report watching TV or videos (movies on video tape, DVD or Blu-ray) for over 2 hours per day (Table 2). Conversely, relative to students in grade 6, students in grades 9, 10, 11 or 12 were less likely to report watching TV or videos for over 2 hours per day. Compared to students with no weekly spending money, the odds of reporting watching over 2 hours of TV or videos per day decreased among students with weekly spending money. Students with lower self-esteem were more likely to report watching over 2 hours per day of TV or videos than students with higher self-esteem (Figure 2).

Playing video games. Compared to students in grade 6, students in grades 7, 8 and 9 were more likely to report playing video games for over 2 hours per day, and students in grades 11 and 12 were less likely to report playing video games for over 2 hours per day. Compared to students with no weekly spending money, the odds of reporting over 2 hours of video games per day decreased among students with $1 to $100 weekly spending money.

FIGURE 2
Model-based odds ratios for spending more than 2 hours per day watching TV, playing video games, or playing/surfing on a computer as a function of self-esteem among students in grades 6 to 12, Canada, 2008/2009



Current smokers were more likely than never smokers to report playing video games for over 2 hours per day. Students with lower self-esteem were more likely to report playing video games for over 2 hours per day than students with higher self-esteem (Figure 2).

Playing or surfing the Internet on a computer. Compared to students in grade 6, students in higher grades were more likely to report playing or surfing on a computer for over 2 hours per day. Compared to students with no weekly spending money, the odds of reporting playing or surfing on a computer for over 2 hours per day increased among those with $1 to $100 weekly spen-ding money. Compared to never smokers, former smokers were less likely to report playing or surfing on a computer for over 2 hours per day. Students with lower self-esteem were more likely to report playing or surfing on a computer for over 2 hours per day than students with higher self-esteem (Figure 2).

Total screen time. Relative to students in grade 6, students in higher grades were more likely to report over 2 hours of total screen time per day. Compared to students with no weekly spending money, the odds of reporting over 2 hours per day of total screen time decreased among students with over $100 weekly spending money. Smoking status was not significantly associated with total screen time. Students with lower self-esteem were more likely to report over 2 hours per day of total screen time than students with higher self-esteem (Figure 2).

Discussion

Developing a better understanding of screen-time behaviours and the factors associated with them can be used to inform the development of prevention programming among youth populations. This study showed that grade 6 to 12 students in our nationally representative sample are very involved in screen-time behaviours; these data also support the recommendation that intervention efforts to reduce screen time must begin prior to adolescence.[17] Given that our

sample demographics are consistent with other North American youth populations,[18,19] these findings are fairly representative within that context.

Our study showed that the majority—over 1.4 million—of Canadian youth in grades 6 to 12 exceeded the recommended guidelines of less than 2 hours of screen time per day.[4] Even when using a conservative estimate of average screen time, the youth in our sample exceeded existing guidelines by over 5 hours per day; the daily average time for each individual screen-based behaviour also exceeded recommendations for total screen time. A substantial number of youth exceeded the guideline recommendations based on their daily time spent in a single screen-time behaviour, consistent with previously published Canadian data from 2001/2002.[6] This suggests that there is substantial room for decreasing screen time by at least 90 minutes per day as recommended by Canada's Physical Activity Guides for Children and Youth.[20] However, considering that screen time is a behaviour distinct from a lack of physical activity[15,21,22] and that many youth with high levels of screen time are also highly active,[21] those behaviour-specific interventions that are designed to reduce screen time by promoting physical activity may be inadequate.

Consistent with earlier research,[5,6,9,11] males were more likely to report more screen time than females. However, in our study this was not consistent across the three screen-based behaviours. Although boys were more likely to watch TV or videos and play video games for over 2 hours per day in the predictive models, the sex of the respondent was not significantly associated with time spent surfing or playing on a computer. Similarly, although earlier research suggested that older students are more likely to report more screen time than younger students,[9] we found that students in higher grades were more likely to play/surf on a computer for over 2 hours per day but less likely to watch TV or videos or play video games for over 2 hours per day compared to grade 6 students. These findings suggest that further research is required to evaluate the impact of sex- or grade-specific interventions to reduce screen time among youth.

To the best of our knowledge, this is the first study to identify a significant association between self-esteem and screen-time behaviour, contradicting previous research that suggested self-esteem was not associated with sedentary behaviour.[11] Since youth who are involved in sports and clubs after school have higher self-esteem than those who are not engaged in such activities,[13] and rates of screen-time behaviours are highest after school,[23] interventions should be designed to engage students in extracurricular activities that could reduce their screen time after school and improve their self-esteem. If effective, such interventions could be very important as low self-esteem and screen time have both been linked to numerous negative health outcomes among youth, such as smoking and other substance abuse.[12,13]

Earlier research suggested that youth with lower income parents are more likely to report more than 2 hours of screen time per day than youth with higher income parents.[9] We found that the disposable income of students is associated with time spent in all three screen-based behaviours, but the direction of the association is not the same across all behaviours. This suggests that a tailored approach to reducing screen time may be required for youth populations based on their disposable income. Consistent with previous research,[12] we also found that current smokers tended to spend more time watching TV and videos and playing video games. It would be useful to evaluate the impact of reducing sedentariness on the smoking behaviour of this sub-population of at-risk youth.

Limitations

This study had several limitations. Since no data on physical activity or obesity exist among the YSS measurement tools, we were unable to examine the association between screen time and these correlates. The measure used for sedentary behaviour in the 2008/2009 YSS do not allow us to calculate respondents' total sedentary time, or to determine the time spent in different sedentary behaviours on weekdays versus weekends. Although the 2008/2009 YSS collected a measure of time spent reading for fun, we did not include this in our research because education stakeholders consider reading for fun constructive due to its positive impact on educational performance rather than lacking a health benefit for youth. Further, causal relationships cannot be inferred from these cross-sectional data. Data were also based on self-reports so the validity of the responses may be questionable; however, honest reporting was encouraged by ensuring confidentiality during data collection.

Conclusion

With the high prevalence of Canadian youth exceeding recommended guidelines for screen time, we need to improve our understanding of the reasons for these sedentary behaviours and their correlates. This may be especially pertinent if the rise in obesity among youth populations is in fact influenced by an overall decrease in energy expenditure due to increased sedentary behaviour. Considering that most nationally representative surveillance data do not monitor different sedentary behaviours,[24] the insight gained from this study provides a better understanding of the prevalence of different screen-time behaviours among Canadian youth as well as insight for tailoring future screen-time reduction interventions.

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References

1. Hills AP, King NA, Armstrong TP. The contribution of physical activity and sedentary behaviours to the growth and development of children and adolescents: implications for overweight and obesity. Sports Med. 2007;37:533-45.

2. Marshall SJ, Biddle SJ, Gorely T, Cameron N, Murdey I. Relationships between media use, body fatness, and physical activity in children and youth: a meta analysis. Int J Obes Relat Metab Disord. 2004;28:1238 46.

3. Crespo CJ, Smit E, Troiana RP, Bartlett SJ, Marcera CA, Andersen RE. Television watching, energy intake, and obesity in U.S. children: results from the third National Health and Nutrition Examination Survey, 1988 1994. Arch Pediatr Adolesc Med. 2001;155:360 5.

4. American Academy of Pediatrics. Committee on Public Education. Children, adolescents, and television. Pediatrics. 2001;107:423 6.

5. Carson V, Pickett W, Janssen I. Screen time and risk behaviors in 10 to 16 year old Canadian youth. Prev Med. 2010;52:99 103. Doi:10.1016/j.ypmed.2010.07.005.

6. Mark AE, Boyce WF, Janssen I. Television viewing, computer use and total screen time in Canadian youth. Paediatr Child Health. 2006;11:595 9.

7. Steffen LM, Dai S, Fulton JE, Labarthe DR. Overweight in children and adolescents associated with TV viewing and parental weight: Project HeartBeat! Am J Prev Med. 2009;37:s50 5.

8. Koezuka N, Koo M, Allison KR, Adlaf EM, Dwyer JJ, Faulkner G, et al. The relationship between sedentary activities and physical inactivity among adolescents: results from the Canadian Community Health Survey. J Adolesc Health. 2006;39:515 22.

9. Carlson SA, Fulton JE, Lee SM, Foley JT, Heitzler C, Huhman M. Influence of limit setting and participation in physical activity on youth screen time. Pediatrics. 2010;126: e89 e96.

10. Barnett TA, O'Loughlin J, Sabiston CM, Karp I, Bélanger M, Van Hulst A, et al. Teens and screens: the influence of screen time on adiposity in adolescents. Am J Epidemiol. 2010;172:255 62

11. Van der Horst K, Paw MJ, Twisk JW, van Mechelen W. A brief review on correlates of physical activity and sedentariness in youth. Med Sci Sports Exerc. 2007;39:1241 50.

12. Hancox RJ, Milne BJ, Poulton R. Association between child and adolescent television viewing and adult health: a longitudinal birth cohort study. Lancet. 2004;364:257 62.

13. Kort Butler LA, Hagewen KJ. School based extracurricular activity involvement and adolescent self esteem: a growth curve analysis. J Youth Adolesc. 2010. Doi 10.1007/s10964 010 9551 4.

14. Health Canada. 2008 09 Youth Smoking Survey. Ottawa (ON): Minister of Supply and Services Canada; 2010 [cited 2010 Jul 25]. Available at: http://www.hc sc.gc.ca/hc ps/tobac tabac/research recherche/stat/ survey sondage 2008 2009/result eng.php

15. Leatherdale ST, Wong SL. Modifiable characteristics associated with sedentary behaviours among youth. Int J Pediatr Obes. 2008;3:93 101.

16. SAS Institute Inc. The SAS System for Windows. Cary (NC): SAS Institute Inc; 2001.

17. Gordon Larsen P, Nelson MC, Popkin BM. Longitudinal physical activity and sedentary behavior trends: adolescence to adulthood. Am J Prev Med. 2004;27:277 83.

18. Ogden CL, Flegal KM, Carroll MD, Johnson CL. Prevalence and trends in overweight among US children and adolescents, 1999 2000. JAMA. 2002;288:1728 32.

19. Shields M. Overweight and obesity among children and youth. Health Rep. 2006;17: 27 42.

20. Public Health Agency of Canada. Canada's physical activity guides for children and youth [Internet]. Ottawa (ON): Public Health of Canada; [cited 2007 Jul 10]. http://www.phac aspc.gc.ca/pau uap/paguide/child youth/index.html

21. Wong SL, Leatherdale ST. Association between sedentary behavior, physical activity, and obesity: inactivity among active kids. Prev Chronic Dis [Internet]. 2009 [cited 2010 Jul 25];6(1). Available from: http://www.cdc.gov/pcd/issues/2009/jan/07 0242.htm

22. Biddle SJ, Gorely T, Stensel DJ. Health enhancing physical activity and sedentary behaviour in children and adolescents. J Sports Sci. 2004;22:679 701.

23. Biddle SJ, Marshall SJ, Gorely T, Cameron N. Temporal and environmental patterns of sedentary and active behaviors during adolescents' leisure time. Int J Behav Med. 2009;16:278 86.

24. Spanier PA, Marshall SJ, Faulkner GE. Tackling the obesity epidemic: a call for sedentary behaviour research. Can J Pub Health. 2006;97:255 7.

Priority issues in occupational cancer research: Ontario stakeholder perspectives

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Abstract

Introduction: Workers are potentially exposed to known and suspected carcinogens in the workplace, many of which have not been fully evaluated. Despite persistent need, research on occupational cancer appears to have declined in recent decades. The formation of the Occupational Cancer Research Centre (OCRC) is an effort to counter this downward trend in Ontario. The OCRC conducted a survey of the broad stakeholder community to learn about priority issues on occupational cancer research.

Methods: The OCRC received 177 responses to its survey from academic, health care, policy, industry, and labour-affiliated stakeholders. Responses were analyzed based on workplace exposures, at-risk occupations and cancers by organ system, stratified by respondents' occupational role.

Discussion: Priority issues identified included workplace exposures such as chemicals, respirable dusts and fibres (e.g. asbestos), radiation (e.g. electromagnetic fields), pesticides, and shift work; and occupations such as miners, construction workers, and health care workers. Insufficient funding and a lack of exposure data were identified as the central barriers to conducting occupational cancer research.

Conclusion: The results of this survey underscore the great need for occupational cancer research in Ontario and beyond. They will be very useful as the OCRC develops its research agenda.

Keywords: cancer, occupation, workplace, consultation, Ontario

Introduction

The International Agency for Research on Cancer (IARC) has classified approximately 60 workplace agents as definite or probable human carcinogens and listed more than 100 as possible occupational carcinogens.[1] Based on initial estimates from the CAREX (CARcinogen EXposure) Canada project,[2] hundreds of thousands of Ontario workers are currently exposed to known and suspected carcinogens. This population continues to grow, so more will be potentially exposed. Although the precise number of occupational cancers in Canada is not known, between 4% and 10% of cancer deaths in developed countries may be due to preventable occupational exposures.[3]

Despite remarkable success in identifying human carcinogens from occupational studies,[1] efforts to identify and characterize potential carcinogens in the workplace have lessened in the past few decades.[4,5,6] New research initiatives are needed to identify undetected carcinogens and better characterize suspected ones, determine which workplaces are affected, estimate the number of workers exposed to these agents and which cancers they cause, and develop and evaluate prevention efforts.[3,6]

The Occupational Cancer Research Centre (OCRC) was launched in early 2009 to address these needs in Ontario. The Centre is devoted to identifying carcinogens and preventing and ultimately eliminating exposures to them in the workplace by conducting surveillance and etiological and intervention research and promoting knowledge transfer. The OCRC is funded by Cancer Care Ontario (CCO), Ontario's cancer agency; the Ontario division of the Canadian Cancer Society (CCS), a non-profit organization; and the Workplace Safety and Insurance Board (WSIB), Ontario workers' compensation board. The Centre was developed in collaboration with United Steelworkers, a workers' union. WSIB also provides funding for several other research centres focused on other areas of occupational health including the Institute for Work and Health (IWH), the Centre for Research Expertise in Occupational Disease (CREOD) and the Centre of Research Expertise for the Prevention of Musculoskeletal Disorders (CRE-MSD).

An extensive and varied stakeholder community also supports the OCRC: academics and researchers, labour unions and workers, employers, health care practitioners, policy makers and advocates, health and safety specialists and industrial hygienists, and members of the public with a general interest in occupational health.

Author references

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Research organizations traditionally employ a variety of strategies to determine priorities in occupational health research, including reviews of published literature, standard expert consultation, and, commonly, rating systems used to reach consensus on priority topics among experts.[7,8,9,10] Since the OCRC was created, in part, to respond to the needs of the broad stakeholder community, we consider it important for input during the development of a research strategy. As a result, one of the Centre's first undertakings was to consult with stakeholders interested in the prevention of occupational cancer; our aim was to understand their views of priorities for occupational cancer research in Ontario and to use this information, along with known gaps in our understanding of the carcinogenic process, to formulate a comprehensive research agenda for the OCRC.

The OCRC stakeholder consultation consisted of an online survey of the stakeholder community in Ontario, as well as those living or working elsewhere who have a connection to the Ontario community, and targeted follow-up interviews with a small sample of survey respondents to provide additional input. The results of the online survey are the focus of this paper.

Methods

Survey

The OCRC informed individuals with an interest in occupational cancer research in Ontario of the survey. The survey included a series of open-ended questions on respondents' views of priority issues in occupational cancer research, perceived barriers to occupational cancer research and the potential solutions to these barriers, types of research currently being conducted, and ways in which stakeholders would like to engage with the Centre.* Information on the geographical location, occupational role and workplace affiliation of respondents was also collected through multiple-choice questions.

The survey protocol and questionnaire were developed in conjunction with the OCRC Steering Committee and Scientific Advisory Committee. The Office of Research Ethics at the University of Toronto determined that the project was exempt from ethics review.

Method of implementation

The online survey, created using SurveyMonkey, was available for completion from June 6 to July 25, 2009. A paper copy was also available on request at the same time. The survey was publicized through a distribution list created by the Centre that included established partners from our funders and partners, academia, industry, labour unions, worker organizations, health care institutions and government organizations. To ensure that the distribution list included active researchers in the field, the Centre performed a scan of research on occupational cancer funded by seven relevant Canadian funding agencies between 2004 and 2009. Because the Centre wanted the survey to be distributed as widely as possible, stakeholders who received the survey were encouraged to forward the survey link to others in their network. For this reason, it is unclear how many individuals were invited to participate.

Analysis

With the guidance of the interim director, two research associates grouped responses to open-ended questions by theme before tabulating frequencies. We grouped exposures based on the listing in Siemiatycki et al.,[1] occupations according to the 2000 Standard Occupational Classification,[11] and cancers by organ system. We calculated frequencies using the statistical package SAS version 9.2 (SAS Institute Inc.)

For comparison, we also stratified responses by respondents' occupational role. To do this, we classified respondents who selected more than one role into the group that was first in the following pre-determined order: worker, researcher/scientist, health and safety specialist and industrial hygienist, health care practitioner, and interested citizen/advocate. We did not include respondents who did not indicate their occupational role (n = 17) or did not fit within these groups (n = 20) in the stratified analyses.

Results

Of the 192 survey responses received, we excluded 15 because values were missing on a large number of variables, leaving 177 surveys for analysis. Most respondents (52%) were directed to the survey link by an email from the OCRC staff. Another large group (24%) learned about it from a colleague or co-worker. One respondent found the survey link on the OCRC website independently. The remainder (24%) received the link from other groups, organizations or industries.

TABLE 1
Characteristics of OCRC stakeholder survey respondents (N = 177)

Characteristic	Number, n	Percent of respondents, %[a]
Geographic location		
Canada		
Ontario	127	71.8
British Columbia	4	2.3
Alberta	3	1.7
Manitoba	3	1.7
Nova Scotia	3	1.7
Quebec	2	1.1
New Brunswick	1	0.6
Newfoundland and Labrador	1	0.6
International	8	4.5
Unspecified	25	14.1
Occupational role[b]		
Researcher/scientist	52	29.4
Health and safety specialist	47	26.6
Industrial hygienist	25	14.1
Interested citizen/advocate	21	11.9
Health practitioner	14	7.9
Policy analyst	13	7.3
Knowledge translation specialist	12	6.8
Worker	12	6.8
Employer	5	2.8
Occupational affiliation[b]		
Academic institution	45	25.4
Government	24	13.6
Labour union	23	13.0
Non-governmental organization	21	11.9
Industry	18	10.2
Health and safety organization	15	8.5
Health care organization	14	7.9
Unaffiliated	6	3.4

[a] Percentages may not add up to 100 due to rounding.

[b] Respondents were able to select more than one occupational role and more than one occupational affiliation.

* The survey questionnaire is available upon request.

Respondent characteristics

The majority of respondents (72%) came from Ontario, nearly 10% came from other provinces in Canada, including British Columbia, Alberta, Manitoba, Nova Scotia, Quebec, New Brunswick and Newfoundland and Labrador, and about 5% came from other countries. Though the largest proportion of respondents identified themselves as either researchers and scientists from academic institutions or else health and safety specialists, there were a variety of occupational roles and affiliations among them (Table 1).

Priority issues in occupational cancer research

Exposures. We identified nearly 100 workplace exposures of interest at various levels of specificity (summarized in Table 2). These included a mix of well-established carcinogens, such as asbestos and benzene, and emergent issues, such as shift work and nano-technology. Several exposures identified by respondents have not been fully evaluated in relation to cancer, and for some a causal link may be unlikely.

Responses stratified by respondents' occupational role showed a similar concern for several broad types of exposures. All groups identified fuels and engine exhausts, contaminated air and water, and asbestos; all groups, except health practitioners, identified chemicals (in general); only researchers and health and safety specialists identified nanoparticles, but nevertheless listed these frequently; and all groups, except workers and interested citizens, frequently listed shift work.

Occupations. Many respondents proposed occupations as a research subject in relation to cancer risk, and listed 45, both broad and specific (summarized in Table 2). Respondents also mentioned several occupations in conjunction with specific exposures or cancers: landscapers, agricultural workers, and farmers in relation to pesticide exposure; miners in relation to either silica or uranium (radiation) and lung cancer; and health care workers in association with shift work. When stratified by occupational role, most groups agreed on several occupations of interest including miners, health care workers and firefighters.

TABLE 2
Priority research issues identified by survey respondents by exposure category, occupation group and cancer site

Characteristic	Number[a], n	
Exposure category		**Commonly listed exposures[b]**
Chemicals	30	—
Respirable dusts and fibres	27	Asbestos, fiberglass, silica
Radiation	24	Electromagnetic fields, nuclear, cell phone, computer, sun
Shift work	16	—
Pesticides	15	—
Nanomaterials	14	—
Exhaust	14	Diesel, gas
Metals and metal compounds	13	—
Work environment	12	Indoor air, environmental tobacco smoke
Solvents	9	Solvents, benzene
Wood, fossil fuels and oils	7	—
Pharmaceuticals	4	Antineoplastic drugs
Plastic and rubber	4	—
Food preparation exposures	2	—
Major occupation group		**Commonly listed exposures[b]**
Construction and extraction	25	Mining, construction worker, painter
Health care	20	Health care worker, carer
Production	14	Welder, nuclear technician
Protective services	10	Firefighter
Farming, fishing, forestry	9	Farmer, agricultural worker
Installation, maintenance, repair	5	Mechanic
Building and grounds cleaning	4	Landscaper
Transportation	3	—
Computer and mathematics	2	—
Food preparation and serving	2	Restaurant worker
Business and financial	1	—
Personal care and service	1	—
Cancer site		**Sub-types**
Breast	17	—
Respiratory	14	Lung, laryngeal, lung adenocarcinoma, nasal
Hematopoietic	10	NHL, lymphoma, AML, cutaneous lymphoma, leukemia, multiple myeloma
Genital	9	Prostate, ovarian, testicular
Digestive	5	Colon, esophageal, liver, pancreatic
Brain	4	—
Skin	3	—
Mesothelioma	2	—
Urinary	2	Bladder
Childhood	2	Childhood cancers, neuroblastoma
Other	2	Sarcoma, thyroid

[a] Number of respondents that identified each exposure, occupation or cancer group.
[b] Listed by two or more respondents.

Cancers. A small portion of respondents identified specific cancers as priorities for occupational research, mentioning 27 at varying levels of specificity (Table 2). Breast cancer, identified by respondents from all occupational roles, was the most commonly listed. Otherwise, groups differed in the cancers they prioritized. Interested citizens identified several specific cancers not mentioned by other groups including cutaneous lymphoma, multiple myeloma and lung adenocarcinoma. Researchers and health and safety specialists were the only groups to mention mesothelioma, a cancer highly attributable to workplace asbestos exposure. Lung cancer was commonly listed

in association with radon exposure and breast and prostate cancer were commonly listed in relationship to shift work, particularly among health care workers.

Other priority research issues. Many respondents (32%) felt that the OCRC should develop specific resources for researchers and other stakeholders, including exposure databases, disease registries and geographic information system (GIS) maps. Others recommended focusing on prevention efforts (28%) or using specific methodologies or study designs (25%) including long-term cohorts, mixed-method studies and biomonitoring. Several respondents (12%) commented on the need to evaluate interaction between two or more exposures, exposures and genes, or exposures and lifestyle factors such as diet, smoking and viral infections. All groups listed developing or improving prevention efforts among their highest priority issues, and all groups except health care practitioners identified specific research products that should be a priority.

Barriers to conducting occupational cancer research in Ontario

Stakeholders gave their opinions on some common barriers to conducting occupational cancer research in Ontario and suggested potential solutions to overcome these. All groups and stakeholders identified insufficient funding as the central barrier to conducting occupational cancer research. Another recurrent theme was a lack of data on exposures and outcomes, along with the difficulties associated with using the results from occupational cancer research in the workplace to reduce risk. Other cited barriers included a lack of awareness about occupational cancer issues, employer/industry resistance, difficulties disentangling exposure relationships, low public and political priority, lack of collaboration and small study populations.

The most commonly cited solution to these barriers was to have different groups from various geographic regions and disciplines collaborate—researchers with employers and workers, researchers with policy makers and labour unions, and stakeholders with researchers. Other popular solutions included increasing awareness of occupational carcinogens, expanding training and education, and strengthening policies and regulations. Researchers and health care practitioners identified collaboration with different groups as the central solution, while health and safety specialists and interested citizens listed awareness and education as most important. Government prioritization topped the list for workers, a solution that was not commonly cited by any other group.

Discussion

The OCRC stakeholder consultation produced a long list of exposures, occupations, cancers and other issues that the community considered a priority for occupational cancer research. The top priorities identified by respondents, namely chemicals and respirable dusts and fibres, are not unexpected as these are encountered in many workplaces. Other identified priorities included a mix of well-established carcinogens (asbestos and radiation), suspected but not proven carcinogens (pesticides and some solvents), current factors of interest (shift work) and emerging exposures whose effects are still largely unknown (nanomaterials).

Many of the exposure priorities identified by OCRC stakeholders echo the research priorities determined by the United States National Occupational Research Agenda (NORA), including the need to better characterize suspected carcinogens (e.g. chemicals), identify emergent carcinogens (e.g. nanomaterials) and continue surveillance of known occupational carcinogens (e.g. asbestos).[3] In addition, CAREX Canada identified many of the specific exposures listed by OCRC stakeholders as among the most prevalent in Ontario, including shift work (745 000 to 1 051 000 workers are exposed, depending on how it is defined), diesel exhaust (275 000 exposed), benzene (112 000 exposed) and asbestos (52 000 exposed).[11]

When we stratified priorities by occupational role, respondents who identified themselves as workers or interested citizens tended to list well-established carcinogens, while researchers, industrial hygienists and health and safety specialists listed these as well as emergent topics. These differences may represent differences in access to information, but may also be due to the size of the sample or unequal participation across groups.

Occupations most commonly listed as priorities for cancer research were a combination of jobs with well-established links with cancer, such as those in construction and extraction, as well as occupations in industries that have been more recently identified as of risk, such as health care work. Within the construction and extraction category, respondents listed occupations such as mining, construction and painting, some of which the IARC has classified as Group 1 (carcinogenic to humans).[12] Health care, which has not traditionally been considered a high-risk sector for cancer, was ranked as the second highest priority for occupational cancer research. This priority ranking is particularly interesting in light of the increased attention to shift work and exposure to antineoplastic pharmaceuticals within the health care industry, both of which were specifically identified as a concern by respondents. Other occupations listed included a variety of industries such as production (welders and nuclear workers), farming, fishing, forestry, protective services (firefighters) and food preparation.

The most frequently listed cancers, i.e. breast and respiratory cancers, are also the ones that occur most commonly in the general population. Lung cancer has been strongly linked with many occupational exposures; however, the relationship between many workplace exposures and breast cancer is not well studied.[1] Nevertheless, there is a growing concern regarding shift work and breast cancer.[13] A number of prominent researchers increasingly recognize that occupational cancer in women should be explored in greater depth.[13]

Other issues identified by respondents as priorities for occupational cancer research point toward an interest in ensuring that research findings are used to improve workplace conditions. The need to encourage and facilitate additional research in this field through the creation of databases and registries is also apparent. Barriers and

solutions identified by respondents emphasize the need to collaborate, build awareness and use innovative methodologies to deal with small populations and low exposures.

The results of this consultation will be highly useful to the OCRC as it develops its research agenda, particularly given the Centre's large community of funders, partners and stakeholders. Results have already been put to use to determine priority exposures and occupations for project development and event planning. For example, in April 2010, the Centre partnered with the Institute for Work and Health to present *Health Effects of Shift Work*, a symposium of international experts that discussed the scientific evidence for the impact of night work/rotating shift work on human health.

The results of this consultation also draw attention to the challenge of developing a research agenda in a field where the demand for information is great, but where there is variable commonality of interest across various stakeholder groups. They underscore the need for an increase in occupational cancer research in Ontario, as well as nationally and internationally; the need to evaluate cancer risks from the large number of suspected occupational carcinogens in the workplace that are of concern to workers and the occupational health community; and the need to move from research to action with greater speed.

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References

1. Siemiatycki J, Richardson L, Straif K, Latreille B, Lakhani R, Campbell S, et al. Listing occupational carcinogens. Environ Health Perspect. 2004;112(15):1447 59.

2. CAREX Canada [Internet]. Carcinogen database. Vancouver (BC): University of British Columbia. [cited 2011 Jan 9]. http://www.carexcanada.ca/en/carcinogen_profiles_and_estimates/

3. Ward EM, Schulte PA, Bayard S, et al; National Occupational Research Agenda Team. Priorities for development of research methods in occupational cancer. Environ Health Perspect. 2003;111(1):1 12.

4. Blair A, Marrett L, Beane Freeman L. Occupational cancer in developed countries. Environ Health. 2011;10 Suppl 1:S9.

5. Vineis P, Cantor K, Gonzales C, Lynge E, Vallyathan V. Occupational cancer in developed and developing countries. Int J Cancer. 1995;62:655 60.

6. Siemiatycki J. Future etiologic research in occupational cancer. Environ Health Perspect. 1995;103(S8):209 15.

7. Choi BC, Eijkemans GJ, Tennassee LM. Prioritization of occupational sentinel health events for workplace health and hazard surveillance: the Pan American health organization experience. J Occup Environ Med. 2001; 43(2):147 57.

8. Harrington JM. Research priorities in occupational medicine: a survey of UK medical opinion by the Delphi technique. Occup Environ Med. 1994;51:289 94.

9. National Institute for Occupational Safety and Health. National Occupational Research Agenda. Atlanta (GA): DHHS (NIOSH); 1996. Publ. No.: 96 115. Available from: http://www. cdc.gov/niosh/docs/96 115/default.html

10. Lavicoli S, Marinaccio A, Vonesch N, Ursini CL, Grandi C, Palmi S. Research priorities in occupational health in Italy. Occup Environ Med. 2001;58:325 9.

11. U.S. Bureau of Labor Statistics, Division of Occupational Employment Statistics. Standard Occupational Classification [Internet]. Washington (DC): United States Department of Labor; 2000 [cited 2010 Jun 2]. Available from: http://www.bls.gov/soc/2000/soc_majo.htm

12. IARC. Agents classified by the IARC monographs Volumes 1 100. Lyon: International Agency for Research on Cancer [Internet]. Lyon (FR): IARC; [updated 2010 Oct 22; accessed 2010 Jun 2]. Available from: http://monographs.iarc.fr/ENG/Classification/ClassificationsAlphaOrder.pdf [Accessed 2 June 2010].

13. Peters C. Occupational exposure to selected priority carcinogens in Ontario. Vancouver (BC): CAREX Canada; June 2010.

14. Straif K, Baan R, Grosse Y, Secretan B, El Ghissassi F, Bouvard V, et al. Carcinogenicity of shift work, painting, and fire fighting. Lancet Oncol. 2007;8:1065 6.

15. Zahm SH, Blair A. Occupational cancer among women: where have we been and where are we going? Am J Ind Med. 2003; 44:565 75.

A review of screening mammography participation and utilization in Canada

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Abstract

Introduction: Participation rate is an important indicator for a screening program's effectiveness; however, the current approach to measuring participation rate in Canada is not comparable with other countries. The objective of this study is to review the measurement of screening mammography participation in Canada, make international comparisons, and propose alternative methods.

Methods: Canadian breast cancer screening program data for women aged 50 to 69 years screened between 2004 and 2006 were extracted from the Canadian Breast Cancer Screening Database (CBCSD). The fee-for-services (FSS) mammography data (opportunistic screening mammography) were obtained from the provincial ministries of health. Both screening mammography program participation and utilization were examined over 24 and 30 months.

Results: Canada's screening participation rate increases from 39.4% for a 24-month cut-off to 43.6% for a 30-month cut-off. The 24-month mammography utilization rate is 63.1% in Canada, and the 30-month utilization rate is 70.4%.

Conclusion: Due to the differences in health service delivery among Canadian provinces, both programmatic participation and overall utilization of mammography at 24 months and 30 months should be monitored.

Keywords: breast, mammography, early detection of cancer, breast cancer, cancer, program participation, program utilization, screening

Introduction

Breast cancer is the second leading cause of death by cancer among Canadian women.[1] About 23 200 women were projected to be diagnosed with breast cancer in 2010, and 5300 women to die from the disease.[1] Screening for breast cancer is widely viewed as a beneficial health intervention, especially for women aged 50 to 69 years. Randomized controlled trials and meta-analyses suggest that programmatic screening reduces mortality by between 25% and 30%;[2-6] however, routine reporting has proven difficult. Reducing mortality in the population eligible for screening is directly related to the rate of participation.[7] As a result, using participation as an interim measure provides a more practical opportunity for routine reporting by programs.

No standardized measure exists for participation in screening mammography. Defining screening participation rates outside of trial settings is complicated by the types of mammography service delivery, which can be both organized breast cancer screening programs and other healthcare facilities. Organized breast cancer screening programs identify and invite eligible women and provide a screening examination (typically a bilateral 2-view screening mammogram on a biennial basis), follow-up of any abnormality, and recall after a normal or benign examination.

How participation is calculated nationally and internationally varies substantially, as do recommended screening intervals and retention. This further complicates routine reporting. Despite this, most programs consistently report on program participation; they have adopted a target of 70% participation based on assumed mortality reduction.[8]

Because of the wide variation in reporting on participation in screening mammography and the interest in determining the most appropriate method of such reporting, the Canadian Partnership Against Cancer formed a working group to (1) review the rationale for the 70% participation rate target for women aged 50 to 69 years and (2) propose alternative methods for calculating routine (biennial) mammography utilization that would more comprehensively reflect the way in which Canadian women receive screening mammography.

Methods

The working group completed a review of selected literature on participation rates in breast cancer screening programs to identify the range of definitions and calculations of participation used by programs in different countries. We selected two definitions for the calculations: *programmatic participation*, the

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proportion of women aged 50 to 69 years screened in an organized breast cancer screening program in a defined period of time among the total population of women of that age (obtained from census data); and *overall utilization*, the combined proportion of women aged 50 to 69 years receiving bilateral mammography (including screening mammography in organized programs, screening mammography outside of organized programs, or bilateral diagnostic mammography outside of organized programs in provinces that do not have non-program screening mammography billing code) among the total population of women aged 50 to 69 years (obtained from census data).

The Canadian Breast Cancer Screening Database (CBCSD) provided data on programmatic screening. The details of individual programs and methods of data collection for the CBCSD are described in detail elsewhere.[9] Provincial ministries of health provided data for fee-for-services (FSS) claims by physicians for mammography services (opportunistic screening mammography). Calculations were performed for the data years 2004 to 2006, the most recent available from both the CBCSD and FFS data sources. Where possible, data from organized screening and FFS were cross-referenced to eliminate duplication; only a very small number of duplicate screens were found. The analysis included data from seven provinces: British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, and Newfoundland and Labrador. Statistics Canada's Canadian Community Health Survey (CCHS) provided self-report data on 24-month screening mammography.[9]

Two screening intervals, 24 and 30 months, were selected as defined periods for assessing programmatic participation and overall utilization of breast cancer screening programs. The 24-month interval represents a strict interpretation of screening interval recommendations and performance targets, while the 30-month interval reflects more realistic adherence to screening interval recommendations.

Results

International breast cancer screening programs show considerable differences in their organization, screening modalities, recruitment methods and target age groups;[10-18] these are likely to affect comparison of participation (Table 1). In Canada, organized programs report upon the participation of women aged 50 to 69 years based on a denominator of first- and second-year populations averaged from census estimates (Table 2). The cumulative probability of returning to a mammography screening program (the reten-tion rate) in Canada, for example, shows that only approximately 30% of the screening population undergo their screening mammography at the strict interval of 24 months (Figure 1).

TABLE 1
Overview of screening programs guidelines and calculation of participation[10-18]

Country	Canada	Australia	New Zealand	European	United Kingdom	Hungary
Organization	Provincial	National	National	—	National	National
Recruitment method	Volunteer	Volunteer/invitation	Volunteer/invitation	Invitation	Invitation	Invitation
Target age range, years	50–69	50–69	50–69	50–69	50–70	45–65
Participation numerator	Number of women screened in a 2-year period	Number of women screened in a 2-year period	Number of women screened in a 2-year period	Number of invited women screened	Number of invited women screened in a 12-month period	Number of invited women screened in a 2-year period
Participation denominator	1st and 2nd year populations averaged from census/forecast	Average of 2-year estimated population on June 30	Smoothed census population estimates over 2 years	Invited population	Invited population in a 12-month period	Invited population in a 2-year period
Target participation rate	≥ 70%	≥ 70%	≥ 70% of women aged 45–69 years	Acceptable: > 70% Desirable: > 75%	Minimum: ≥ 70% Target: ≥ 80%	Acceptable: > 70% Desirable: > 75%

Notes: In addition to accepting volunteers, some Canadian provinces also send letters of invitation to the target population. This differs from Australia and New Zealand, where all programs accept volunteers and send letters of invitation, and from the United Kingdom and Hungary, where only women who receive a letter of invitation are accepted.

Participation in programmatic breast cancer screening was 39.4% (24-month interval) and 43.6% (30-month interval) in Canada. When utilization was calculated by incorporating FFS screening, the estimates rose to 63.1% and 70.4% respectively (Table 3). The 30-month utilization estimate is close to the 70% target set by most countries, while the 24-month utilization estimate closely approximates the CCHS self-reported screening by Canadian women. Increases in programmatic participation and overall utilization were accrued by using a 30-month period; however, these increases varied provincially between 3.3% and 15.7% (Table 3).

TABLE 2
Breast screening programs in Canada: usual practices in 2004 and 2006

Province	Program start date	Target age group, years	Availability of mobile screening	CBE offered
British Columbia	1988	50–69	Yes	No
Alberta	1990	50–69	Yes	No
Saskatchewan	1990	50–69	Yes	No
Manitoba	1995	50–69	Yes	No[a]
Ontario	1990	50–69	Yes	Yes[b]
Quebec	1998	50–69	Yes	No
Newfoundland and Labrador	1996	50–69	No	Yes[c]

Abbreviations: CBE, clinical breast examination.

[a] Nurse or technologist provided CBE service until October 2005.

[b] Nurse provides CBE at 52% of sites.

[c] Nurse completes CBE.

Discussion

Accurate estimates of participation in screening mammography are essential to determine the impact of screening on mortality. Reports on participation indicators (programmatic screening, utilization and self-reports) must consider the context, the limitations in the methodology of calculation and the screening interval (24 versus 30 months), and the practices of the programs being compared.

All the methods available in the Canadian context have limitations. The current practice of reporting only programmatic screening excludes a substantial amount of screening mammography, leading to substantial underestimation of the potential mortality reduction. Estimates of self-reported mammography utilization are consistent across jurisdictions; however, they rely on survey participant recall, which is thought to result in an overestimation of desirable behaviour.[19] Mammography utilization may exaggerate the impact on mortality because FFS screening does not include features such as population-based recruitment, automated recall/reminders for subsequent screening, coordinated follow-up of abnormal screening, systematic quality assurance and routine performance evaluation. In addition, both misclassification of diagnostic mammograms as screening mammograms and double counting of women screening in both the FFS and programmatic sector can artificially elevate the utilization rate and lead to overestimating the benefit to mortality. Further, programs varied in their capacity to eliminate double counting for the utilization rate, but those that succeeded found an inconsequential amount of double counting. The 24-month self-reported and utilization rates are similar (Table 3), suggesting that both methods may be more acc rate than previously reported, or at least similarly biased.

The use of a 30-month screening interval to account for the "true" screening interval overestimates rates of biennial screening mammography (Figure 1). While screening outcomes, including the abnormality recall rate and cancer detection rate, appear to hardly vary among women who return for screening by 30 months versus 24 months,[9] delaying diagnosis and treatment by as little as 3 to 6 months may be associated with worse survival.[20] However, the United Kingdom Breast Screening Frequency Trial, using indirect indicators of outcome, found a relatively small effect on breast cancer mortality when comparing annual screening to a 3-year screening interval.[21] Given the conflicting evidence, it is difficult to determine if screening programs that

FIGURE 1

Cumulative probability of returning for a subsequent breast cancer screen by age group, among women who participated in screening in the years 2000 and 2001

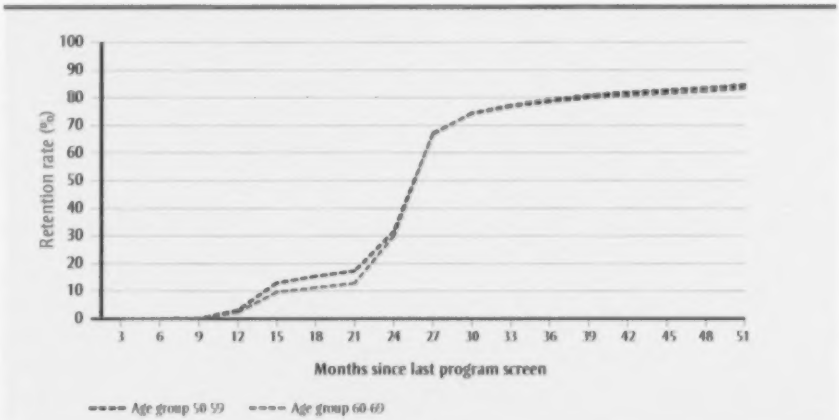

TABLE 3

Screening mammography programmatic participation and overall utilization, nationally and by province, 2004-2006

Area	Participation in program at 24 months[a] %	Participation in program at 30 months[b] %	Overall utilization at 24 months[a] %	Overall utilization at 30 months[b] %	Self-reported screening mammography 24 months[c] % (95% CI)
Canada	39.4	43.6	63.1	70.4	62.5 (60.9–64.1)
British Columbia[d]	51.1	55.1	60.0	65.4	60.1 (55.7–64.6)
Alberta[d]	9.1	10.8	62.8	70.9	64.0 (58.4–69.3)
Saskatchewan[d]	48.3	54.8	60.9	68.8	63.7 (58.1–69.2)
Manitoba[d,e]	52.5	56.5	63.7	69.4	56.1 (50.1–62.1)
Ontario[d]	32.4	36.5	63.5	72.5	62.7 (59.8–65.7)
Quebec[d]	51.6	56.7	64.6	70.4	64.3 (61.0–67.6)
Newfoundland an Labrador[d]	35.4	36.6	63.9	68.6	61.5 (55.0–68.1)

Abbreviations: CI, confidence interval.

[a] 24-month period from January 1, 2005, to December 31, 2006.

[b] 30-month period from January 1, 2004, to June 30, 2006.

[c] 2008 Canadian Community Health Survey[9]

[d] Provincial fee-for-service code definitions available upon request.

[e] 24-month period from April 1, 2005, to March 31, 2007; 30-month period from April 1, 2004, to September 30, 2006.

obtain 70% participation over 24 months will outperform, in terms of their effect on mortality, those programs that obtain the same rate of participation over a 30-month screening interval.

Of note is the low rate of programmatic screening in Alberta compared to the rest of Canada (9.1% vs. 39.4%) (Table 3). During the period under study, 2004 to 2006, the organized breast cancer screening program in Alberta included a fixed site clinic in each of two major cities and a mobile service in remote areas. Mammography services were also available through the FFS sector in the rest of the province. As a result, their mammography utilization rates were comparable to that of national rates (70.9% vs. 70.4%, respectively). A province-wide breast cancer screening program was launched in March 2008.

Ensuring that participation rates are internationally comparable is extremely difficult. An indicator must have as little bias as possible and accurately reflect practices that maximize mortality reduction. In addition, the context of program practices must always be considered when making comparisons. While most programs report on women aged 50 to 69 years, Hungary and United Kingdom use a wider age range (Table 1). Most programs rely on biennial recall, but the United Kingdom uses a 3-yearly approach. Most importantly, calculation of both the denominator and numerator varies considerably; the Canadian method results in the most conservative estimates of participation (Table 1).

Conclusion

In general, measures of overall program utilization in Canada suggest that breast cancer screening is occurring at close-to-target levels, but the impact on mortality of overall utilization cannot be assumed to be equivalent to that of programmatic screening. This is due to insufficient information concerning the quality of FFS mammography screening.

Due to the differences in provincial health care structures and service delivery, and the significant amount of opportunistic mammography that takes place in Canada, we conclude that both programmatic participation and overall utilization of mammography at 24 months and 30 months should be monitored and reported. Moreover, reporting on multiple participation indicators may facilitate the comparison of mammography usage internationally.

Acknowledgements

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References

1. Canadian Cancer Society's Steering Committee. Canadian Cancer Statistics 2010. Canadian Cancer Society. Toronto (ON): Canadian Cancer Society; 2010.

2. Andersson I, Aspegren K, Janzon L, Landberg T, Lindholm K, Linell F, et al. Mammographic screening and mortality from breast cancer: the Malmo mammographic screening trial. BMJ. 1988;297:943-8.

3. Alexander FE, Anderson TJ, Brown HK, Forrest AP, Hepburn W, Kirkpatrick AE, et al. 14 years of follow up from the Edinburgh randomised trial of breast cancer screening. Lancet. 1999;353;1903-08

4. Duffy SW, Tabar L, Vitak B, Yen MF, Warwick J, Smith RA, et al. The Swedish Two-County Trial of mammographic screening: cluster randomisation and end point evaluation. Ann Oncol. 2003;14(8):1196-8.

5. Shapiro S, Strax P, Venet L. Periodic breast cancer screening in reducing mortality from breast cancer. JAMA. 1971;215:1777-85.

6. International Agency for Research on Cancer Screening. IARC Handbooks of Cancer Prevention, Vol.7, Breast Cancer Screening. Lyon (FR): IARC Press; 2002.

7. Day NE, Williams DR, Khaw KT. Breast cancer screening programmes: the development of a monitoring and evaluation system. Br J Cancer. 1989;59(6):954-8.

8. Forrest AP. Breast cancer: the decision to screen. 4th H.M. Queen Elizabeth The Queen Mother Fellowship; 1990. London (UK): Nuffield Provincial Hospitals Trust; 1990.

9. Public Health Agency of Canada. Organized breast cancer screening programs in Canada: report on program performance in 2005 and 2006. Ottawa (ON): Health Canada. Forthcoming 2011.

10. Evaluation Indicators Monitoring Group. Guidelines for monitoring breast screening program performance, 2nd ed. Ottawa (ON): Public Health Agency of Canada; 2007 Mar.

11. BreastScreen Australia Data Dictionary Version 1 [Internet]. [place unknown]: National Quality Management Committee; 2004 [cited 2009 Mar 7]. Available at: http://www.cancerscreening.gov.au/internet/screening/publishing.nsf/Content/br-dictionary/$File/bsa-dd.pdf

12. BreastScreen Aotearoa Data Management Manual Version 4.0 [Internet]. [place unknown]: National Screening Unit Breast Screen Aotearoa; 2010 Mar Available at: http://www.nsu.govt.nz/files/BSA/Data_management_manual.pdf

13. Consolidated guidance on standards for the NHS Breast Screening Programme. NHSBSP Publication No 60 version 2. London (UK): NHS Cancer Screening Programmes; 2005 Apr.

14. Boncz I, Sebestyen A, Dobrossy L, Pentek Z, Budai A, Kovacs A, et al. The organisation and results of first screening round of the Hungarian nationwide organized cancer screening programme. Ann Oncol. 2007;18:795-9.

15. National Quality Management Committee of BreastScreen Australia. BreastScreen Australia National Accreditation Standards, Quality Improvement Program. BreastScreen Australia; Jul 2001, revised 2008 Apr.

16. Breastscreen Aotearoa [Internet]. New Zealand National Health Board; 2009 [cited 2009 Mar 7]. Available from: http://www.nsu.govt.nz/Current-NSU-Programmes/559.asp

17. Taylor R, Arnett K, Begg S. BreastScreen Aotearoa Independent Monitoring Report, January June, 2007 [Internet]. Queensland (AU): School of Population Health, University of Queensland; 2007 [cited 2009 Mar 7]. Available from: http://www.nsu.govt.nz/Health Professionals/1048.asp

18. Perry N, Broeders M, De Wolf C, Tornberg S, Holland R, Von Karsa L, Puthaar E, editors. European guidelines for quality assurance in breast cancer screening and diagnosis, 4th ed. Health & Consumer Protection Directorate General, European Communities: Brussels (LU); 2006.

19. Bancej CM, Maxwell CJ, Snider J. Inconsistent self reported mammography history: findings from the National Population Health Survey longitudinal cohort. BMC Health Serv Res. 2004;4:32.

20. Richards MA, Westcombe AM, Love SB, Littlejohns P, Ramirez AJ. Influence of delay on survival in patients with breast cancer: a systematic review. Lancet. 1999;353(9159): 1119-26.

21. Breast Screening Frequency Trial Group. The frequency of breast cancer screening: results from the UKCCCR Randomised Trial. United Kingdom Co ordinating Committee on Cancer Research. Eur J Cancer. 2002; 38:1458-64.

The prevalence of chronic pain and pain-related interference in the Canadian population from 1994 to 2008

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This article has been peer reviewed.

Abstract

Introduction: Estimates of the prevalence of chronic pain worldwide and in Canada are inconsistent. Our primary objectives were to determine the prevalence of chronic pain by sex and age and to determine the prevalence of pain-related interference for Canadian men and women between 1994 and 2008.

Methods: Using data from seven cross-sectional cycles in the National Population Health Survey and the Canadian Community Health Survey, we defined two categorical outcomes, chronic pain and pain-related interference with activities.

Results: Prevalence of chronic pain ranged from 15.1% in 1996/97 to 18.9% in 1994/95. Chronic pain was most prevalent among women (range: 16.5% to 21.5%), and in the oldest (65 years plus) age group (range: 23.9% to 31.3%). Women aged 65 years plus consistently reported the highest prevalence of chronic pain (range: 26.0% to 34.2%). The majority of adult Canadians who reported chronic pain also reported at least a few activities prevented due to this pain (range: 11.4% to 13.3% of the overall population).

Conclusion: Similar to international estimates, this Canadian population-based study confirms that chronic pain persists and impacts daily activities. Further study with more detailed definitions of pain and pain-related interference is warranted.

Keywords: chronic pain, prevalence, sociodemographic factors, general population, activity prevention

Introduction

Approximately 17% of Canadians—3.9 million individuals aged 15 years plus—reported having chronic pain or some discomfort.[1] Chronic pain interferes with quality of life, including the social and family aspects, and with the ability to work.[2] In 2010, the Chronic Pain Association of Canada reported that "the annual cost of chronic pain, including medical expenses, lost income, and lost productivity, but not the social costs, is estimated to exceed $10 billion."[3]

The prevalence of non-specific chronic pain in the general population is reported to be as high as 55%.[4,5] Canadian studies have also reported a broad range of estimates of prevalence of chronic pain, from 11% to 44%.[1,2,6-13] These studies used time frames ranging from 3 to 6 months[2,6,7,12] or defined pain as usual pain/often troubled with pain;[1,8-11,13] however, pain definitions with a broader time frame (i.e. usual or persistent pain) reported lower prevalence estimates.[1,8-11,13] Moreover, of all the Canadian reports only five were large population-based studies[1,9-11,13] and three of these reported on older data from the National Population Health Survey (NPHS) 1996/97 cycle.[9,11,13]

Both Canadian and international prevalence estimates of chronic pain varied by age and sex, with a higher prevalence in females[2,5,6,10,12,14-18] and in the older age group.[2,5,8-11,14,15,17-20] Not all of the Canadian studies that examined the prevalence of chronic pain within gender and age categories are representative of the general population; one study included a participant sample representative of seven counties in southeastern Ontario[12] and another of a city near Toronto.[8] Nevertheless, the available evidence from cross-sectional population-based studies that used older data (from 1996/97) and from smaller studies suggests that in Canada, women and older individuals report chronic pain more often. Although previous studies found that pain interferes with daily activities,[1,2,7,8,10,12,13] no studies have addressed the interference of chronic pain in Canadians over time.

The purpose of our study was to examine the overall prevalence of chronic pain and pain-related interference in Canadians over time, regardless of the factors associated with it. The specific research objectives were to (1) examine the prevalence of chronic pain in the Canadian population from 1994 to 2008; (2) describe the sex and age differences in prevalence of chronic pain; and (3) describe the sex differences in pain-related interference with activities of daily living.

Methods

Questionnaire and data collection

Our study used data from seven cross-sectional cycles from the Household component of the NPHS (1994/95, 1996/97 and 1998/99) and the Canadian Community Health Survey (CCHS) (2000/01, 2003, 2005 and 2007/08) to document chronic pain in Canada over time. These surveys collect information on participants' health status, determinants of health and use of health

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and medical services through structured interviews held in person and by telephone.[21,22]

The NPHS began in 1994 as both a cross-sectional and longitudinal survey; in 2000/01, the cross-sectional component of the NPHS became part of the CCHS, still conducted by Statistics Canada.[21] Both the NPHS and CCHS took place biennially until 2007, when the CCHS became an annual survey, but the combined data for the two years (2007/08) were also released.[23] Both surveys were developed by specialists at Health Canada, Statistics Canada and provincial health ministries as well as academic researchers in relevant fields; advisory and expert committees approved the questionnaires. Further information on the sample design of the NPHS and CCHS is available elsewhere.[21,22]

Population and sample

We included NPHS participants aged 25 years plus and CCHS participants aged 20 years plus. The difference in the age groups is due to the different age categories used in the variation tables provided by Statistics Canada (12–24, 25–44, 45–64 and 65+ years for NPHS; 12–19, 20–29, 30–44, 45–64, and 65+ years for CCHS). Although some of the previous studies included participants as young as 15 years old,[11,14,15,19] we limited age to 20 years and over to avoid combining and comparing adolescents and adults. Two prospective studies[24,25] and one study that used the NPHS data[13] also used data for those aged 25 years plus at baseline; hence we can compare our results with published results.

In the 1994/95, 1996/97 and 1998/99 NPHS, the household sample was selected from the 10 provinces and included 17 626 participants, 81 804 participants and 17 244 participants respectively.[26-28] The participants were selected using two different sampling techniques including clusters and dwellings.[21] In the 2000/01, 2003, 2005 and 2007/08 CCHS, 65 000 participants from 121 health regions from all the provinces and territories were required each year.[22] The sample sizes were 130 827 participants in 2000/01, 134 072 in 2003, 132 947 in 2005 and 131 061 in 2007/08.[23,29-31] The most recent census was used to guide the sample population and account for recent deaths, births and estimated migration; if needed, changes were made to the surveyed health regions based on the latest census.[23,26-31] Moreover, when results are weighted correctly, the NPHS and CCHS are representative of the covered population including the provinces and territories from which they were sampled.[23,26-31] Both the NPHS and CCHS household cross-sectional components excluded residents of institutions, reserves and some remote areas and full-time members of the Canadian forces.[21,22] Response rates for all of the cycles used in this study were greater than 77.6%.

Variables

Outcome variable: pain and pain interference

We defined chronic pain using the following question: "Are you usually free of pain or discomfort?"[26-30,32,33] Participants who responded "no" were considered to have chronic pain. These individuals were then asked how many activities their pain or discomfort prevented, choosing from "none," "a few," "some" or "most."[26-30,32,33] This definition, used in several studies, is thought to be a valid measure of the prevalence of chronic pain in the general population.[9,13]

Independent variables: age and sex

We examined the presence of "usual pain" by sex and by age and the number of activities prevented due to this pain by sex. Participants were grouped into age categories depending on the variation tables provided by Statistics Canada (25–44, 45–64, 65+ years for NPHS; 20–44 [20–29 and 30–44], 45–64, 65+ years for CCHS).

Data analysis

We analyzed the data for each NPHS and CCHS cycle separately using SPSS version 16.0 (IBM). For each statistical test, the sample was weighted to the Canadian population using the appropriate weighting variable for each cycle.[23,26-31] The Canadian population was described by sex for each cycle using numbers and percentages. Significant differences in the prevalence estimates and measures of prevented activities between groups were identified using 95% confidence intervals (CIs). Sampling weights were applied to all estimates to allow for generalization to the Canadian population. Only groups that included at least 30 sampled participants were reported as indicated in the release guidelines set out by Statistics Canada.[26,29] We compared all numbers reported to the Statistics Canada Sampling Variability Tables to determine if the cell frequency for a given variable was large enough to avoid an individual being identified: if the coefficient of variation was between 0.0 and 16.5, it was acceptable to release; if 16.6 to 33.3, it was considered marginal and numbers were allowed to be released with a caution (in the NPHS, coefficient of variations between 25.1 and 33.3 could only be released with the exact variance); and if greater than 33.3, it could not be released.[26,29] Confidence intervals were obtained using the Sampling Variability Tables. For the CCHS 2003, estimates were obtained using a subsample macro file in the Research Data Centre at Queen's University and we performed bootstrapping and obtained confidence intervals in STATA: Data Analysis and Statistical Software version 11.0 (StataCorp LP). Bootstrap-ping allows robust standard error estimates and confidence intervals for a variety of estimates, including means and proportions.[34] We replicated five hundred samples for each analysis to ensure results were not significant due to large sample sizes.

The Queen's University Health Sciences and Affiliated Teaching Hospitals Research Ethics Board reviewed and approved this analysis.

Results

Population

The ratio of men to women was similar across years and between provinces, with a higher ratio of women to men; the reverse was seen in the Yukon, Northwest Territories and Nunavut. The Canadian population to which these results are generalizable (i.e. non-military, non-institutionalized, etc.) increased from 18 836 000 individuals in 1994/95 to 24 639 000 in 2007/08.

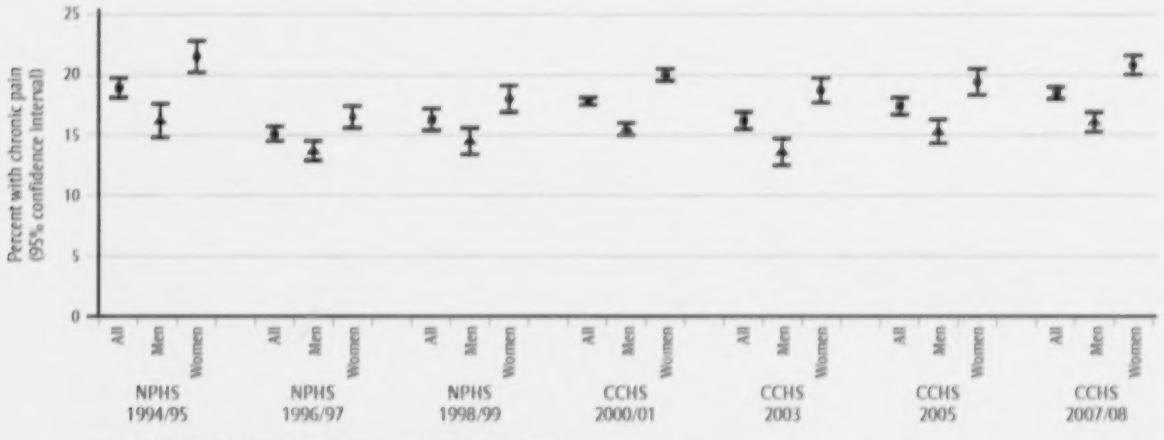
Chronic pain

In the first cycle (1994/95), 18.9% (95% CI: 18.1–19.7) of the Canadian population reported chronic pain; in the next cycle (1996/97), this percentage dropped to 15.1%

(95% CI: 14.5–15.7). Since then, this percentage has increased overall to a high of 18.5% (95% CI: 18.0–19.0) in 2007/08. Generally, the prevalence reported in consecutive cycles was not significantly different from one to the next. However, the 1996/97 cycle reported a significantly lower prevalence compared to all others except the 1998/99 cycle. Figure 1 shows the prevalence of chronic pain between 1994/95 and 2007/08.

Women reported higher pain estimates in every surveyed cycle compared to men. The prevalence of chronic pain in women ranged from 16.5% (95% CI: 15.6–17.4) in 1996/97 to 21.5% (95% CI: 20.2–22.8) in 1994/95 and in men from 13.6% (95% CI:

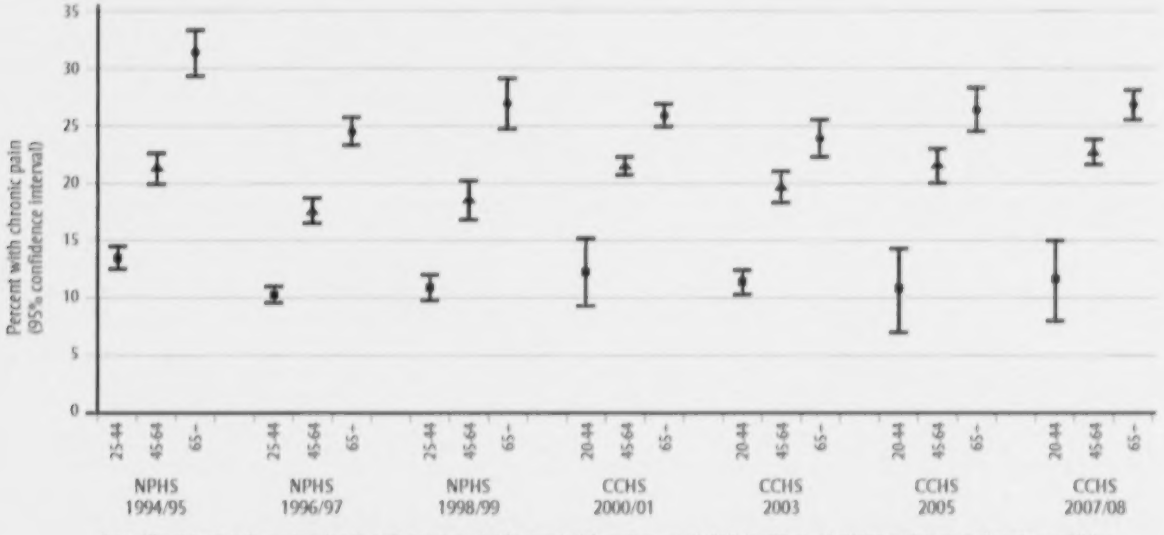
FIGURE 1
Crude prevalence of chronic pain in men and women in the Canadian population based on the cross-sectional data from the National Population Health Survey and Canadian Community Health Survey



*NPHS included people 25 years and older and CCHS included 20 years and older.

Notes: All participants in the provinces (not the territories) were asked the "usual pain" questions on each NPHS. In 2000/01 and 2007/08, participants in all provinces and Yukon, Northwest Territories (NWT) and Nunavut answered the pain questions. In 2003, participants in the East coast and Quebec answered the pain questions and in 2005, participants in British Columbia answered the pain questions; however, these results were then weighted to the rest of the population.

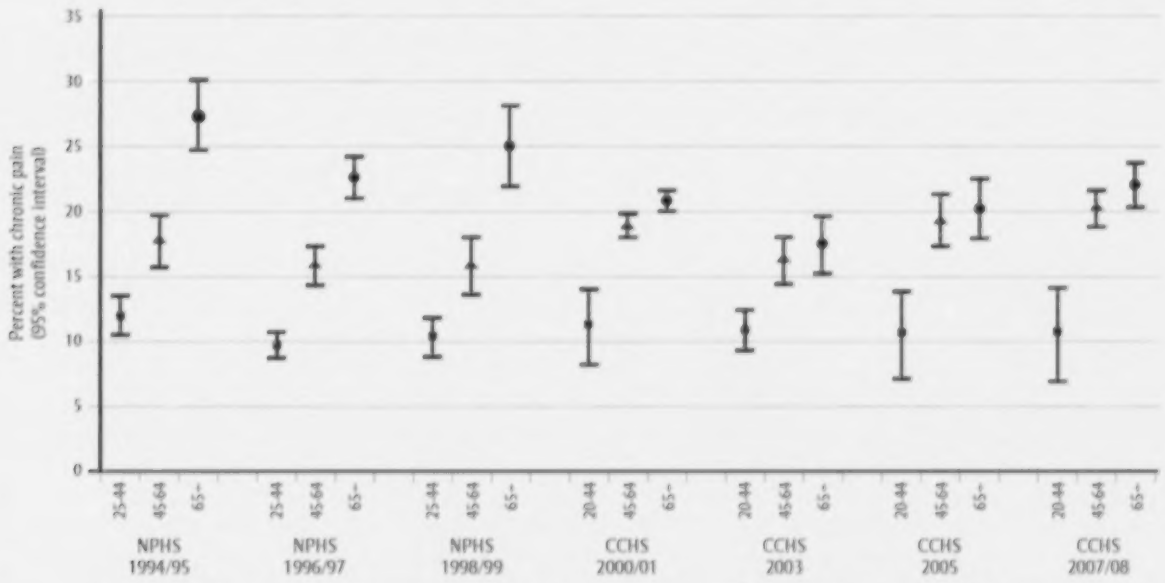
FIGURE 2
Crude prevalence of chronic pain in the Canadian population based on the cross-sectional data from the National Population Health Survey and Canadian Community Health Survey by age



Notes: All participants in the provinces (not the territories) were asked the "usual pain" questions on each NPHS. In 2000/01 and 2007/08, participants in all provinces and Yukon, Northwest Territories (NWT) and Nunavut answered the pain questions. In 2003, participants in the East coast and Quebec answered the pain questions and in 2005, participants in British Columbia answered the pain questions; however, these results were then weighted to the rest of the population.

FIGURE 3

Crude prevalence of chronic pain in men in the Canadian population based on the cross-sectional data from the National Population Health Survey and Canadian Community Health Survey by age



Notes: All participants in the provinces (not the territories) were asked the "usual pain" questions on each NPHS. In 2000/01 and 2007/08, participants in all provinces and Yukon, Northwest Territories (NWT) and Nunavut answered the pain questions. In 2003, participants in the East coast and Quebec answered the pain questions and in 2005, participants in British Columbia answered the pain questions; however, these results were then weighted to the rest of the population.

12.5–14.7) in 2003 to 16.2% (95% CI: 14.8–17.6) in 1994/95. In general, there were no significant differences in pain prevalence by sex over time; however, there were significant differences between sexes (Figure 1).

The prevalence of pain was significantly different between age groups (Figure 2). The oldest age group (65+ years) reported the highest prevalence of chronic pain (range: 23.9% to 31.3%); there was no significant trend over time. Generally, there was a significant difference in the prevalence of chronic pain reported between the age groups in both men and women (Figures 3 and 4); further, women in the two oldest age groups (45–64 and 65+ years) reported significantly higher prevalence estimates than did men in these age groups. Women aged 65 years plus consistently reported the highest prevalence of chronic pain, ranging from 26.0% (95% CI: 24.4–27.6) in 1996/97 to 34.2% (95% CI: 31.9–36.5) in 1994/95.

Level of activities prevented chronic pain

The majority of the population with chronic pain reported interference with activities: 11.4% of the entire population in 1996/97 (95% CI: 10.8–12.0) to 13.3% of the entire population in 2000/01 (95% CI: 13.0–13.6) and 2007/08 (95% CI: 12.8–13.8) reported at least a few prevented activities (Figure 5). Overall, compared to men at each surveyed year, women reported more interference and significantly more pain that prevented a few activities and some activities (Figure 6). Generally, there was no difference between women and men reporting pain that prevented no activities and most activities. Also, there was no statistically significant difference between consecutive years; further, the patterns are similar between prevalence of chronic pain and pain interference over the years.

Missing data for the chronic pain variables in each cycle ranged from 0.1% to 0.5%.

Discussion

This is the first study to examine the prevalence and interference of chronic pain over a 14-year period (1994–2008) in Canadian adults.

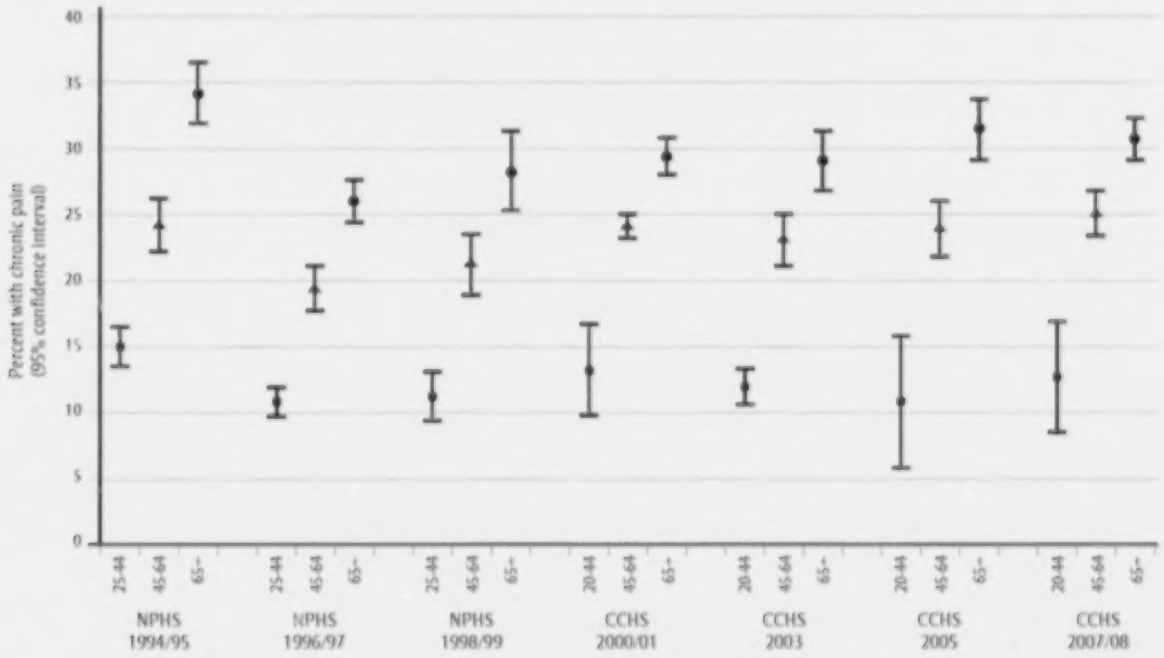
With the exception of a significant decrease in chronic pain from the first cycle (1994/95) to the second cycle (1996/97) (Figure 1), the prevalence of chronic pain gradually increased over time. The overall temporal trend was not significant; however, there was a significant difference between the cycle years 1996/97 and 2007/08, indicating real increases in chronic pain over time.

Our study reported prevalence estimates (15.1% to 18.9%) that were within earlier Canadian estimates (11% to 44%).[3,6-11] The differences could be attributed to differences in sampling methodology, sample sizes and definitions of chronic pain. Population level studies with large sample sizes (10 000 participants or more) such as ours were more likely to report smaller prevalence estimates (11% to ~21%) than were studies with fewer participants.[1,9-11,13-15,35,36]

Studies using the same or similar definitions as the NPHS and CCHS reported prevalence estimates (11% to 17%) comparable to our findings.[3,8-11,13] Three of these used the 1996/97 NPHS cycle,[9-11,13] with one reporting

FIGURE 4

Crude prevalence of chronic pain in women in the Canadian population based on the cross-sectional data from the National Population Health Survey and Canadian Community Health Survey by age



Notes: All participants in the provinces (not the territories) were asked the "usual pain" questions on each NPHS. In 2000/01 and 2007/08, participants in all provinces and Yukon, Northwest Territories (NWT) and Nunavut answered the pain questions. In 2003, participants in the East coast and Quebec answered the pain questions and in 2005, participants in British Columbia answered the pain questions; however, these results were then weighted to the rest of the population.

only chronic non-cancer pain[10] and another reporting all chronic pain;[11] nevertheless, prevalence estimates remained similar. Studies that used a concrete timeframe to define chronic pain (e.g. 3 or 6 months) were more likely to report higher estimates of chronic pain than we found when using a more general timeframe (i.e. usual pain).[5,6,7,12] However, small sample sizes may also have affected the reported prevalence estimates.[5,6,7,12] Further, it was not clear that all reports of estimates of chronic pain were based on a validated measure.[19,25,27] Results from studies not using a validated definition should be interpreted with caution.

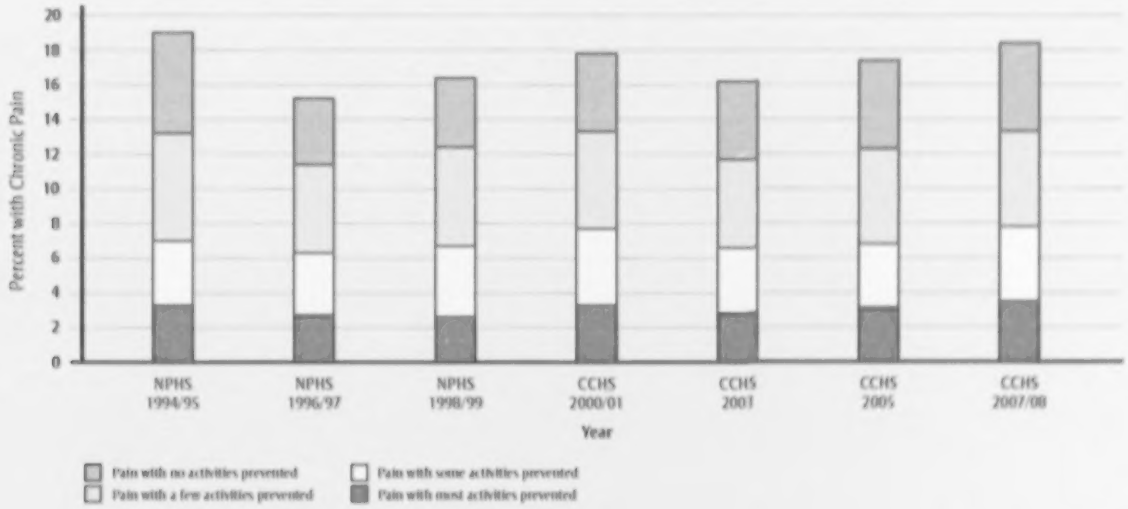
The majority of those reporting chronic pain also reported interference in daily activities as a result of this pain; moreover, the level of interference in activities due to chronic pain (range: 11.4% to 13.3%) is consistent with an Australian study also reporting inter-ference in daily activities (women: 13.5%; men: 11.0%).[14]

We found that women were more likely to report chronic pain than were men and that chronic pain generally increased with age. These findings were consistent across survey cycles and are supported by the literature.[1,5,6-8, 11,12,14-18,20,27] We also found that chronic pain was most prevalent in the women's oldest age group (65+ years) and that most participants reporting chronic pain also reported interference with activities due to pain, with women reporting more interference than did men.

One limitation of our study is that we did not control for diseases known to be associated with chronic pain, such as arthritis, and therefore we could not distinguish between condition-related pain and chronic pain of unknown origin. This may partially explain the higher reported prevalence of chronic pain in older women who are known to report more chronic pain conditions than do men (e.g. due to fibromyalgia, arthritis/rheumatism, back problems, and migraine headaches).[28] Differences in prevalence estimates worldwide may be true differences, or they may be due to a number of factors, including lifestyle, age distribution, and pain perception and treatment.[26] A longitudinal study is necessary to elucidate factors that increase the risk of chronic pain.

Second, although the NPHS and CCHS household cross-sectional components are representative of most of Canada, they both exclude residents of institutions.[21,22] As a result, the prevalence of chronic pain in the Canadian population may be underreported as nursing homes and other long-term care facilities most likely have many individuals suffering from chronic pain.[23] Third, the pain question does not specify a time frame for "usual pain." Individuals with other conditions may also be reporting chronic pain. However, our findings are similar to the results reported in a cross-sectional study using 1996/97 NPHS data that controlled for medical and health factors.[11] Moreover,

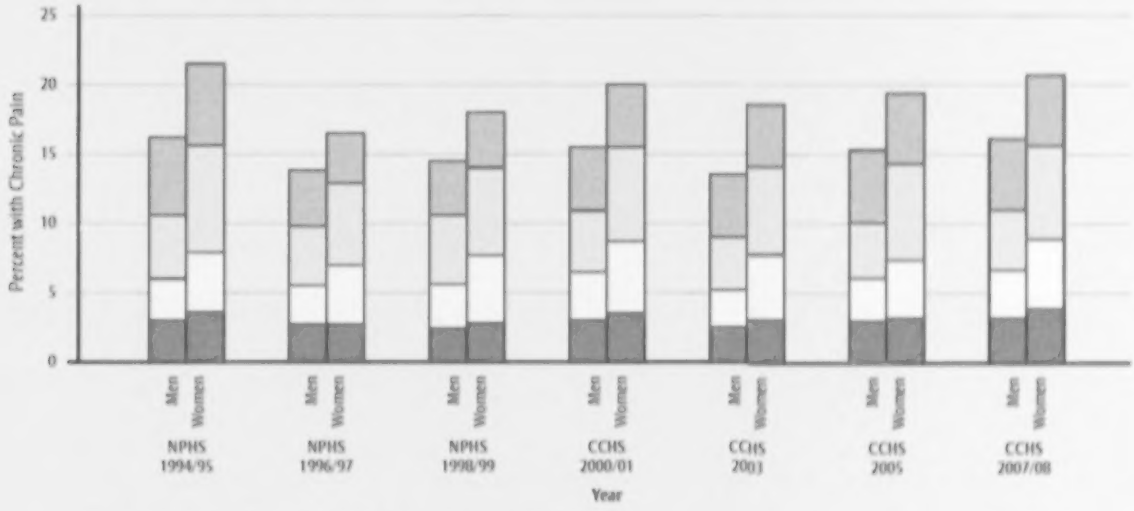
FIGURE 5
Crude prevalence of chronic pain with the level of activity prevented using cross-sectional data from the National Population Health Survey and Canadian Community Health Survey



* NPHS included people 25 years and older and CCHS included 20 years and older

Notes: All participants in the provinces (not the territories) were asked the "usual pain" questions on each NPHS. In 2000/01 and 2007/08, participants in all provinces and Yukon, Northwest Territories (NWT) and Nunavut answered the pain questions. In 2003, participants in the East coast and Quebec answered the pain questions and in 2005, participants in British Columbia answered the pain questions; however, these results were then weighted to the rest of the population.

FIGURE 6
Crude prevalence of chronic pain in men and women with the level of activity prevented using cross-sectional data from the National Population Health Survey and Canadian Community Health Survey



* NPHS included people 25 years and older and CCHS included 20 years and older

Notes: All participants in the provinces (not the territories) were asked the "usual pain" questions on each NPHS. In 2000/01 and 2007/08, participants in all provinces and Yukon, Northwest Territories (NWT) and Nunavut answered the pain questions. In 2003, participants in the East coast and Quebec answered the pain questions and in 2005, participants in British Columbia answered the pain questions; however, these results were then weighted to the rest of the population.

previous studies using general pain definitions reported similar prevalence estimates of chronic pain.[1,8,11,13] The age groups, although similar, are not identical between the NPHS (25 years plus) and CCHS (20 years plus), but results are similar across cycles. Similar age groups were used in the literature, so our results could be compared to those of previous studies.[13,24,35] Finally, recall bias may be an issue due to self-reported questionnaires.

There are substantial strengths to this study. The seven NPHS and CCHS cycles were each based upon a large random sample with minimal missing data. This large random sample supports the generalizability of the findings to the rest of the population (excluding those few areas mentioned above). Further, Van Den Kerkhof et al. compared the Canadian census data to the NPHS 1996/97 data using direct standardization and found the sample to be representative and generalizable to the overall Canadian population.[13] Also, the pain questions are considered to be a valid measure of chronic pain.[9,13,39] Thus these results provide a reliable and accurate estimate of the prevalence of chronic pain and interference in daily activities as a result of pain in the Canadian population.

Conclusion

This study is the first to examine the prevalence of chronic pain over a number of years in Canada; it demonstrated that chronic pain is prevalent in the Canadian population (range: 15.1% to 18.9%), that it is most prevalent among women (range: 16.5% to 21.5%) and the older population (range: 23.9% to 31.3%), and that many of those with chronic pain were prevented from taking part in at least a few activities by this pain (range: 11.4% to 13.3%). Cross-sectional studies do not identify the incidence of a disease or predictors and/or causes of a disease or illness. Therefore, future research includes the need for a longitudinal study to identify the incidence and predictors of chronic pain in Canadians.

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References

1. Millar WJ. Chronic pain. Health Rep. 1996; 7(4):47-53.
2. Moulin DE, Clark AJ, Speechley M, Morley-Forster PK. Chronic pain in Canada — prevalence, treatment, impact and the role of opioid analgesia. Pain Res Manag. 2002 Winter;7(4):179-84.
3. Pain Facts [Internet]. Edmonton (AB): Chronic Pain Association of Canada. [cited 2010 Apr 5]. Available from: http://www.chronicpaincanada.com
4. Andersson HI, Ejlertsson G, Leden I, Rosenberg C. Chronic pain in a geographically defined general population: studies of differences in age, gender, social class, and pain localization. Clin J Pain. 1993;9(3): 174-82.
5. Elliott AM, Smith BH, Penny KI, Smith WC, Chambers WA. The epidemiology of chronic pain in the community. Lancet. 1999 Oct; 354(9186):1248-52.
6. Birse TM, Lander J. Prevalence of chronic pain. Can J Public Health. 1998 Mar-Apr; 89(2):129-31.
7. Boulanger A, Clark AJ, Squire P, Cui E, Horbay GL. Chronic pain in Canada: have we improved our management of chronic non-cancer pain? Pain Res Manag. 2007 Spring; 12(1):39-47.
8. Crook J, Rideout E, Browne G. The prevalence of pain complaints in a general population. Pain. 1984 Mar;18(3):299-314.
9. Health Surveillance Alberta Health. Chronic pain in Alberta: a portrait from the 1996 National Population Health Survey and the 2001 Canadian Community Health Survey [Internet]. 2003 May [cited 2011 Jan 26]. Available from: www.health.alberta.ca/documents/Chronic-Pain-Survey-2003.pdf
10. Mesana M, Cho R, DesMeules M. Chronic pain: the extra burden on Canadian women. BMC Womens Health. 2004 Aug; 4 Suppl 1:S17.
11. Rashiq S, Dick BD. Factors associated with chronic noncancer pain in the Canadian population. Pain Res Manag. 2009 Nov-Dec; 14(6):454-60.
12. Tripp DA, VanDenKerkhof EG, McAlister M. Prevalence and determinants of pain and pain-related disability in urban and rural settings in southeastern Ontario. Pain Res Manag. 2006 Winter;11(4):225-33.
13. Van Den Kerkhof EG, Hopman WM, Towheed TE, Anastassiades TP, Goldstein DH; Canadian Multicentre Osteoporosis Study Research Group. The impact of sampling and measurement on the prevalence of self-reported pain in Canada. Pain Res Manag. 2003 Fall;8(3):157-63.
14. Blyth FM, March LM, Brnabic AJ, Jorm LR, Williamson M, Cousins MJ. Chronic pain in Australia: a prevalence study. Pain. 2001 Jan;89(2-3):127-34.
15. Eriksen J, Jensen MK, Sjogren P, Ekholm O, Rasmussen NK. Epidemiology of chronic non-malignant pain in Denmark. Pain. 2003 Dec;106(3):221-8.
16. Rustoen T, Wahl AK, Hanestad BR, Lerdal A, Paul S, Miaskowski C. Prevalence and characteristics of chronic pain in the general Norwegian population. Eur J Pain. 2004 Dec;8(6):555-65.
17. Sa K, Baptista AF, Matos MA, Lessa I. Prevalence of chronic pain and associated factors in the population of Salvador, Bahia. Rev Saude Publica. 2009 Aug; 43(4):622-30.
18. Catala E, Reig E, Artes M, Lopez JS, Segu JL, Aliaga L. Prevalence of pain in the Spanish population: telephone survey in 5000 homes. Eur J Pain. 2002 April;6(2): 133-40.
19. Sjogren P, Ekholm O, Peuckmann V, Gronbaek M. Epidemiology of chronic pain in Denmark: an update. Eur J Pain. 2009 Mar;13(3):287-92.

20. Ng KF, Tsui SL, Chan WS. Prevalence of common chronic pain in Hong Kong adults. Clin J Pain. 2002 Sep-Oct;18(5):275-81.

21. Statistics Canada. National Population Health Survey - Household Component - Cross-sectional (NPHS) [Internet]. Ottawa (ON): Statistics Canada; 2000 [cited 2009 Jun 25]. Available from: http://www.statcan.gc.ca/cgi-bin/imdb/p2SV.pl?Function=getSurvey&SDDS=3236&Lang=en&db=imdb&adm=8&dis=2

22. Statistics Canada. Canadian Community Health Survey (CCHS) [Internet]. Ottawa (ON): Statistics Canada; 2009 [updated 2009 Jun 24; cited 2010 Mar 1]. Available from: http://www.statcan.gc.ca/cgi-bin/imdb/p2SV.pl?Function=getSurvey&SDDS=3226&Lang=en&db=imdb&adm=8&dis=2

23. Health Statistics Division, Statistics Canada. Canadian Community Health Survey, 2007-2008, Cycle 4.1 [Data files and documentation (User Guide-2007/2008 Main File)] [Internet]. Ottawa (ON): Statistics Canada; 2009 [cited 2010 Mar 1]. Available from: http://search1.odesi.ca/details/view.html?q=Canadian+Community+Health+Survey,+2007-2008,+2009+Cycle+4.1&field-6=all-all&date-gt=1871&date-lt=2011&uri=/odesi/esec-823M00013-F-2007-2008-c4.1.xml

24. Elliott AM, Smith BH, Hannaford PC, Smith WC, Chambers WA. The course of chronic pain in the community: results of a 4-year follow-up study. Pain. 2002 Sept; 99(1-2): 299-307.

25. Magni G, Marchetti M, Moreschi C, Merskey H, Luchini SR. Chronic musculoskeletal pain and depressive symptoms in the National Health and Nutrition Examination. I. Epidemiologic follow-up study. Pain. 1993 May;53 (2):163-8.

26. Statistics Canada. National Population Health Survey 1994-1995 user's guide [Internet]. Ottawa (ON): Statistics Canada; 2010 [updated 2010 Jan 7; cited 2010 Mar 1]. Available from: http://www.statcan.gc.ca/dli-ihl/data-donnees/ftp/nphs-enup/nphs1994-enup-1994-eng.htm

27. Statistics Canada. National Population Health Survey 1996-1997 user's guide and questionnaire [Internet]. Ottawa (ON): Statistics Canada; 2010 [updated 2010 Jan 7; cited 2010 Mar 1]. Available from: http://www.statcan.gc.ca/dli-ihl/data-donnees/ftp/nphs-enup/nphs1996-enup1996-eng.htm

28. Statistics Canada. National Population Health Survey 1998-1999 questionnaire, user's guide [Internet]. Ottawa (ON): Statistics Canada; 2010 [updated 2010 Jan 7; cited 2010 Mar 1]. Available from: http://www.statcan.gc.ca/dli-ihl/data-donnees/ftp/nphs-enup/nphs-1998-enup1998-eng.htm

29. Statistics Canada. Cycle 1.1 Questionnaire, code book, user's guide [Internet]. Ottawa (ON): Statistics Canada; 2010 [updated 2010 Jan 7; cited 2010 Mar 1]. Available from: http://www.statcan.gc.ca/dli-ihl/data-donnees/ftp/cchs-escc/cchs-escc1-1-eng.htm

30. Statistics Canada. Cycle 2.1 questionnaire, user's guide [Internet]. Ottawa (ON): Statistics Canada; 2005 [updated 2010 Jan 7; cited 2010 Mar 1]. Available from: http://www.statcan.gc.ca/dli-ihl/data-donnees/ftp/cchs-escc/cchs-escc2-1-eng.htm

31. Statistics Canada. Canadian Community Health Survey (CCHS) cycle 3.1 (2005): public use microdata file (PUMF) user guide [Internet]. Ottawa (ON): Statistics Canada; 2006 [cited 2010 Mar 1]. Available from: http://www.statcan.gc.ca/dli-ihl/meta/cchs-escc/cycle3-1/guide-eng.pdf

32. Statistics Canada. Canadian Community Health Survey Cycle 3.1 Final Questionnaire [Internet]. 2005 [cited 2011 Apr 20]. Available from: http://www.statcan.gc.ca/imdb-bmdi/instrument/3226_Q1_V3-eng.pdf

33. Statistics Canada. Canadian Community Health Survey (CCHS) - 2007 Questionnaire [Internet]. 2007 [cited 2011 Apr 20]. Available from: http://www.statcan.gc.ca/imdb-bmdi/instrument/3226_Q1_V4-eng.pdf

34. SPSS Inc. IBM SPSS Bootstrapping 19: Part 1: Users Guide: Bootstrapping [Internet]. 2010 [cited 2011 April 20] Available from: http://support.spss.com/productext/statistics/documentation/19/client/User%20Manuals/English/IBM%20SPSS%20Bootstrapping%2019.pdf

35. Hanft J, Jacobsen C, Goldberg J, Nickel R, Buchwald D. Prevalence of chronic pain in a representative sample in the United States. 2008; Pain Med. 2008 Oct;9(7):803-12.

36. Breivik H, Collett B, Ventafridda V, Cohen R, Gallacher D. Survey of chronic pain in Europe: prevalence, impact on daily life, and treatment. Eur J Pain. 2006 May;10(4):287-333.

37. Von Korff M, Dworkin SF, Le Resche L. Graded chronic pain status: an epidemiologic evaluation. Pain. 1990 Mar;40(3):279-91.

38. Munce SE, Stewart DE. Gender differences in depression and chronic pain conditions in a national epidemiologic survey. Psychosomatics. 2007 Sep-Oct;48(5): 394-9.

39. Statistics Canada. National Population Health Survey: Health Institutions Component, Longitudinal (NPHS) [Internet]. 2000 [cited 2009 Apr 27] Available from: http://www.statcan.gc.ca/cgi-bin/imdb/p2SV.pl?Function=getSurvey&SurvId=19819&SurvVer=1&InstaId=2008&InstaVer=2&SDDS=5003&Lang=en&db=IMDB&adm=8&dis=2

Can we use medical examiners' records for suicide surveillance and prevention research in Nova Scotia?

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Abstract

Introduction: Medical examiners' records can contribute to our understanding of the extent of suicide in a population, as well as associated sociodemographic and other factors.

Methods: Using a mixed methods approach, the key objective of this pilot study was to determine the sources and types of information found in the Nova Scotia Medical Examiner Service (NSMES) records that might inform suicide surveillance and targeted prevention efforts. A secondary objective was to describe the one-year cohort of 108 individuals who died by suicide in 2006 in terms of available sociodemographic information and health care use in the year prior to death.

Results: Data extraction revealed inconsistencies both across and within files in terms of the types and amounts of sociodemographic and other data collected, preventing correlational analyses. However, linkage of the records to administrative databases revealed frequent health care use in the month prior to death.

Conclusion: The introduction of systematic data collection to NSMES investigations may yield a comprehensive dataset useful for policy development and population level research.

Keywords: suicide, population surveillance, medical examiner, coroner, administrative data

Introduction

With approximately 90 recorded deaths due to suicide in Nova Scotia each year, suicide is a considerable public health problem, despite being largely preventable.[1] In addition to being highly traumatic for family members and friends, suicide is costly. The potential years of life lost (PYLL) due to suicide are substantial: for those aged under 74 years, only cancers (all sites), circulatory disease and unintentional injuries accounted for more PYLL from 2005 to 2007.[2] These figures may well be underestimates, since suicide is widely believed to be underreported.

A number of factors contribute to the under-reporting of suicides, such as failing to suspect suicide (particularly among the elderly or in the absence of notes or other indications of a possible suicide). In addition, determining intent is particularly difficult in some instances, such as in deaths due to poisoning. Rates of suicide by poisoning may be underestimated by approximately 30%, relating to a 10% underreporting of overall suicide rates.[3] An Ontario study of the validity of death certification of unnatural adult deaths highlighted the difficulty in determining intent due to the subjectivity of interpretation.[4] Deaths due to hanging or inhalation of noxious gas were more likely to be attributed to suicide than those due to poisoning or drowning; death due to overdose of over-the-counter medication was certified more frequently as suicide than death as a result of heroin overdose. Increasing proof of intent resulted in increased odds of correct certification as suicide. In addition, some physicians may be reluctant to report suicide as the cause of death due to stigma or financial implications for family members.[5]

When suicide is suspected, the manner of death is determined in a medico-legal process that can be informed by different types of evidence, including an investigation of the scene, post-mortem examination results, collection of medical histories and circumstantial information. The systems for the investigation of suicides vary across Canadian provinces and territories; some jurisdictions possess a medical examiner system and others a coroner system.[6] Medical examiners are physicians, while coroners may have legal,

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investigative or medical backgrounds. In 1960, the *Fatality Inquiries Act* established the Nova Scotia Medical Examiner Service (NSMES); a 1989 amendment to the Act established a provincial Chief Medical Examiner (CME).[6] The current iteration of the provincial medical examiner system operates out of a central office in Halifax, Nova Scotia.

NSMES is responsible for investigating "all deaths due to violence, undue means, culpable negligence and unexpected/unexplained deaths throughout the province,"[6] which includes all deaths due to suicide. The primary role of NSMES is to identify the decedent; establish the date, time, place and cause of death; and, in the case of apparent suicide, determine the intent. These duties are described in detail in the Nova Scotia *Fatality Investigations Act*.[7] The scope of each investigation varies depending upon the circumstances of death, but the aim is always to determine intent.

Clearly, accurately classifying suicide is necessary to identify those factors that may serve as target points for intervention and prevention strategies. However, a lack of standardized criteria for classifying suicide and difficulties in applying these criteria in a consistent fashion contribute to potential inaccuracies in classification.[4,8,9]

Despite these limitations, medical examiners' records are important sources of information and may contribute to our understanding of both the extent of suicide in a population and associated sociodemographic and other factors.[9-14] Similar records have proven useful for research and surveillance in other jurisdictions, including elsewhere in Canada, England and the United States.[11,13,15-20] However, information collected by NSMES to date has not been used for surveillance, and only on occasion for research.[21]

Research suggests several individual risk factors associated with suicide: many decedents have a history of mental health or addiction problems[22,23,24] and men and boys appear to be at elevated risk, often through the use of more lethal methods.[5,15,20,25,26] Other reported risk factors include increasing age,[26] rural residence,[18] household firearm ownership,[27] social isolation,[25] low socio-economic status,[18,26] chronic pain, terminal illnesses or disabilities,[28] or being the victim or perpetrator of domestic violence.[20]

NSMES investigations provide an opportunity to collect more detailed information, including on known risk factors. Further, medical examiner and other death investigation systems have specific geographical mandates, creating population-based data sources. Death certificates or trauma registries contain incomplete information about deaths due to suicide, and as such cannot alone inform prevention policies or epidemiological research.

The purpose of our research was to examine the content of the information collected by NSMES for suicide cases to: (1) determine the types and sources of available information that might be useful for suicide prevention research; and (2) develop a "profile" of suicides in order to highlight the information that could be used as part of an ongoing surveillance system. For the latter objective, we linked each suicide to health service data from the provincial administrative databases to provide a profile of health service use in the year prior to the death.

The Dalhousie University Ethics Review Board and the Nova Scotia Department of Justice reviewed and approved the research prior to the collection of any data.

Methods

We used a mixed methods approach, the qualitative component to assess the types and sources of information available in the files, and the quantitative component to provide a "profile" of suicides in Nova Scotia. For each component, we manually extracted data from NSMES records for all deaths due to suicide for a one-year period from January 1, 2006, to December 31, 2006 (n = 108). We chose a one-year period in order to obtain enough data to effectively assess the types and sources of information in the files and to build a profile of suicides; the year 2006 was the most recent one-year period for which all files on suicide were "closed," that is, no new information would be added to the file.

Qualitative component: types and sources of information

For the qualitative component of the study, our research assistant reviewed each suicide file to record the existence of discrete sociodemographic and other related information (e.g. where the body was found) and ascertain other types of information within the files and the source(s) of this information. For example, information given by a family member concerning the social life of the decedent was recorded as "family member provides social information," with no other identifying information.

Data regarding the types and sources of other information were extracted and recorded in a text document. This text document was then imported into the computer software program NVivo 7 (QSR International) to manage and sort by source and type of information. Our primary qualitative researchers (LJ, RB) regularly provided feedback throughout the extraction and sorting process to ensure that a comprehensive listing of types and sources of information was captured. Memos were developed and constantly updated throughout data extraction to note any modifications to the working definitions of categories of sources and types of information. Modifications were made when a working definition was deemed incomplete.

We developed various categories (e.g. legal issues, social issues) for the different types of information and defined sources as the people (e.g. physicians), places (e.g. morgues) and documents (e.g. health records) that provided information.

Quantitative component: profile of suicides

The quantitative component of the study consisted of constructing an anonymized Access 2003 (Microsoft) database based on the information extracted manually from the NSMES files. The database included available information collected by the medical examiner service on demographic, personal, social and event-related factors (e.g. cause of death, precipitating circumstances) and prior health service use. Data were exported from the database into an Excel 2003 (Microsoft) spreadsheet and checked for duplicates and errors before being analysed using Statistical Package for Social Sciences v 12 (SPSS).

Where possible, these data were linked to the provincial health service administrative databases to determine decedents' health service use (inpatient and outpatient general and mental health services) in the final year of life. We used the following datasets held by the Population Health Research Unit (PHRU) in the Department of Community Health and Epidemiology at Dalhousie University: Canadian Institute for Health Information (CIHI) Discharge Abstract Database of hospital admission/separation dates and diagnostic codes; fee-for-service claims by physicians; and Mental Health Outpatient Information System.

Linkage of the databases was made possible by means of encrypted health card numbers in a process approved by the Department of Justice, the Dalhousie University Research Ethics Board and the PHRU Data Access Committee.

We calculated quantitative descriptive statistics (rates, percentages) for individual demographic factors reported in the NSMES files and prior health service use in Nova Scotia over a one-year period. Incomplete data capture precluded analysis of known risk factors.

Due to the need to suppress small cells to protect the anonymity of decedents, we classified health care episodes only as mental health or non-mental health, and reported for the year and the month prior to suicide. Despite this relatively high level of aggregation, we were unable to report the specific types of health care use (i.e. inpatient vs. outpatient, mental health vs. non-mental health) within the week prior to suicide due to small numbers. A sample size or power calculation was not required, as the project involved reporting all cases of suicide in Nova Scotia over the given time period and specific hypotheses were not tested.

Results

Qualitative component: types and sources of information

In a population of 913 462 in Nova Scotia in 2006, 108 deaths were due to suicide.[29] Each of these deaths had been investigated by NSMES and therefore had a file on record. Each of the 108 files showed the same basic structure: information about all processes and communications related to events from the time the medical examiner was contacted until the file was closed and an official report completed by the Chief Medical Examiner. However, the files varied greatly in terms of details.

All files provided information on age, sex, address of residence, the place where the body was found and cause of death. Other sociodemographic and related information, such as marital and employment status, was recorded to varying degrees and sometimes inconsistently. For example, in one section of the file the decedent might be described as married, but in another as separated.

We identified 16 different types of information (e.g. autopsy information, death scene) from the 108 files (see Table 1). We deemed the frequency of information common if it was in 60% or more of the files, and less common if in fewer than 60% of the files.

We also found and classified 10 sources of information. Of these 10 sources, 5 were classified as common sources of information as they were in all or the majority (i.e. 60% or more) of files: family/friends, health records, medical examiner(s)/investigators, physicians (including military physicians) and police (including military police). Fewer than 60% of the files contained information from other sources; these included consultants (e.g. neuropathologists), emergency medical responders, funeral homes, morgues and tissue banks.

Quantitative component

The derived quantitative database included available information from the 108 files of decedents' demographics, place of suicide, disclosed intent, cause of death, prior health care contacts, previous suicide attempts, medical and psychiatric diagnoses, and precipitating circumstances. Basic demographic factors (age, sex, address, cause of death and place of death) were recorded consistently across files.

From this database, we determined that the mean age of decedents was 44.7 years (standard deviation [SD] ± 13.3 years) and individuals in their forties made up one-third of the cases (n = 36) (see Table 2). The female to male ratio was 1:5, with 18 (16.7%) decedents female and 90 (83.3%) male. Just over half the sample lived in rural areas (defined as those areas outside Halifax Regional Municipality), which is similar to the general Nova Scotian population average of 59% in 2006.[29] The most common causes of death were hanging (38.9%), self-poisoning (24.1%) and firearm injuries (19.4%). The most common locations were at home (56.5%) or in a public place such as a bridge, park, woods or beach (27.8%).

TABLE 1
Types of information from NSMES records of suicide case files[a]

Frequency of information	Type of information
Common (i.e. present in 60% or more files)	Autopsy information
	Cause of death
	Death circumstances
	Death notifications – procedures
	Death registration
	Death scene
	Health information
	Immediate prior activities
	Medical/police response/activities
	Place and details/accounts of body discovery
	Sociodemographic information
	Sociopersonal information
Less common (i.e. present in fewer than 60% of files)	Critical life incidents
	Legal issues
	Request for specific records or information (e.g. dental records)
	Suicide plans or attempts

Abbreviations: NSMES, Nova Scotia Medical Examiner Service.

[a] All cases of death due to suicide manually extracted from NSMES records from January 1, 2006, to December 31, 2006.

Differences in cause of death by sex were apparent: the most common forms of suicide among women and girls were self-poisoning (38.9%) and hanging (33.3%); among men and boys, these were hanging (40%), firearm injuries (23.3%) and self-poisoning (21.1%). All of the decedents who died by firearm injury were male, with two-thirds of these deaths due to long gun (rifle or shotgun) discharge. While not all precipitating circumstances were captured in the NSMES files, all of the 18 cases in which a recent break-up of a relationship was reported involved male decedents.

Aside from basic demographic information, not all files contained the same amount of information. For example, while the age and sex of decedents were in all files, employment status was missing in 43.5%. Most files (69%) were missing information on known previous suicide attempts, and 28% lacked information on any psychiatric diagnoses. In the case of deaths by hanging, 98% were missing information on the ligature source, point and degree of suspension. Similarly, in the case of firearm deaths, 90% lacked information regarding ownership, license status and storage of the firearm.

We supplemented the health service use data by linking our derived database with the provincial administrative health services databases using encrypted health card numbers. Of those decedents whose health card numbers were retrievable (n = 101), most (74%) had been in contact with health services (either as an in- or outpatient) in the year prior to suicide; over half (55%) had been seen as outpatients and nearly one-quarter (23%) had been hospitalized for mental health reasons in the year preceding suicide; 10% had been in hospital for mental health reasons in the month prior to suicide; 16% had had some form of contact with the health care system within the week prior to suicide; and 9% were seen as outpatients by either a GP or psychiatrist for mental health reasons in the week prior to suicide.

Discussion

The NSMES files can serve as a rich source of information for surveillance and suicide prevention efforts. They can provide more detailed data than the provincial health service administrative databases, including as they do information on precipitating circumstances such as relationship break-ups, marital problems, employment losses, encounters with violence (either as perpetrator or victim), legal problems and problems with school, work or finances. Since NSMES conducts an autopsy on all deaths by suicide or potentially by suicide, their records necessarily include a far more complete source of medical comorbidities than any other database.

Our review of the NSMES files found that some sociodemographic information (i.e. age, address, sex, marital status) was recorded in all of the files, although marital status was not always consistently recorded. Other information (e.g. employment status) was not always recorded although such information would be useful for surveillance and prevention research purposes. Our findings are in keeping with the results of a 2005 study of coroners' files in England in which demographic characteristics such as sex, age and marital status were generally well recorded, but employment information was missing in over one-third of cases, precluding robust socio-economic classification.[13]

The relative consistency of recording basic demographic information allowed us to provide a general profile of individuals who died by suicide in Nova Scotia over a one-year period. Our findings of higher rates among men and boys, and those in mid-life, were consistent with patterns observed in other jurisdictions.[5,15,20,25,26,30] In our study, as in others, men and boys were more likely to use highly lethal means of suicide, likely increasing the odds of classification as suicide.[15,20,25] Lack of consistency of collection of information regarding other risk factors prevented us from conducting more sophisticated analyses.

Information on known risk factors, such as health issues, can inform surveillance and prevention efforts. In particular, information about mental illnesses (e.g. personality disorders or major depressive episodes), substance use and/or multiple chronic physical health problems is useful since such health issues place individuals at higher risk of suicide.[22,31] However, such information was variably reported in the files we examined. We were able to overcome this limitation, to some extent, by linking with health records from provincial administrative databases when valid encrypted health card numbers were available for decedents (101 of 108 files). Nevertheless, most health-related information was not consistently available in the NSMES files.

Firearm data may be particularly useful for informing public policy, yet our study demonstrates that most files do not contain information on ownership, license status and storage. In the case of deaths by hanging, ligature information is similarly scarce. However, this may be less relevant for policy development as ligature materials are widely available to the public. Such information may be of greater relevance in institutional settings.

Other socio-economic conditions and factors, such as living on social disability, low income, low educational attainment, significant losses (e.g. of relationships or employment), a criminal record (and related fears of arrest or imprisonment) and social isolation, are also major potential risk factors for suicide.[32-34] This information is also variably recorded in the NSMES files. This problem is neither unique to Nova Scotia nor to Canada: such a limitation has also been reported by researchers examining coroners' or medical examiners' reports in other jurisdictions.[9,13]

There appear to be at least four main reasons for the variations across files, as well as the inconsistencies within files: (1) information is collected by different people (e.g. various investigators, police officers, etc.) who may record information to varying degrees; (2) information is collected from different sources (e.g. family, friends or physicians) who may know the decedent in different ways and to varying degrees or who may interpret the investigators' questions in different ways; (3) the medical charts of decedents may not always be requested, received or recorded consistently; and (4) there is no structured interview procedure used when most of the social and medical/health information is gathered from family and friends in particular. Collecting information from family or friends may be further complicated by their hesitation to report any declarations of intent because of financial reasons (e.g. insurance) or the stigma associated with suicide.

TABLE 2
Demographic description of suicide cases in NSMES records from January 1, 2006, to December 31, 2006 (N = 108)[a]

Characteristic	Number of cases, n (%)	
Age, years		
<30	15	(13.9)
30–39	23	(21.3)
40–49	36	(33.3)
50–59	21	(19.4)
60–69	7	(6.5)
≥ 70	6	(5.6)
Sex		
Male	90	(83.3)
Female	18	(1.7)
Place of Residence		
Urban	52	(48.1)
Rural	56	(51.9)
Cause of Death		
Hanging	42	(38.9)
Self-poisoning	26	(24.1)
Firearm injury	21	(19.4)
Drowning	6	(5.6)
Blunt force injury	5	(4.6)
Other	8	(7.4)
Location of Death		
Home	61	(56.5)
Public (e.g. bridge, woods)	30	(27.8)
Vehicle	6	(5.6)
Property of family or friends	6	(5.6)
Other	5	(4.6)

Abbreviations: NSMES, Nova Scotia Medical Examiner Service.

[a] All cases of death due to suicide manually extracted from NSMES records from January 1, 2006, to December 31, 2006.

These explanations all point to an overarching principle: data collection by a medical examiner or coroner takes place in an investigative context, not a research context. As such, the goal is to determine the cause and circumstances of individual deaths and, in the case of suicide, to determine intent, not to collect standardized data. However, systematically collected information would contribute to a rich source of data useful for population level surveillance and prevention research activities.

The relevance of this information is not limited to Nova Scotia. Statistics Canada has initiated a Canadian Coroner and Medical Examiner Database (CCMED) that will store information on deaths reported by coroners and medical examiners.[35] This will facilitate the identification and characterization of emerging and known safety hazards, thus contributing to the prevention of avoidable deaths among Canadians. The ability of the CCMED to meet this objective will depend upon the quality and completeness of the data.

In order to provide a complete, representative Nova Scotian database, we recommend that the fields for collection be determined and populated consistently during medical examiners' investigations. While the operational impact of this change may be minimal, this endeavour is a marked conceptual departure from the way the NSMES is currently described in legislation.

Limitations

Qualitative component. Given that data were collected over a one-year period, there may be other types and sources of information provided in files outside of this period. However, many of the types and sources of data found in our review were repeated across files, suggesting that we were able to determine most, if not all, types and sources of information.

Quantitative component. We had planned to determine whether certain types of information about the suicide (e.g. information about mental health issues) might be collected systematically according to sociodemographic characteristics (e.g. age category, sex). However, during data collection and analysis we discovered that there were few structured questions consistently asked of each suicide, resulting in incomplete data capture, and therefore this type of analysis could not be undertaken. We were able to overcome this limitation in the case of health service use by linking with administrative databases, but we were otherwise unable to determine associations between variables that have been identified as risk factors for suicide (e.g. mental health problems).

Small cell sizes were also limiting. We suppressed cells smaller than 5 to prevent inadvertent identification of individuals. Future work could include preparation of a larger historical cohort.

Conclusion

To date, the data collected by NSMES in the course of its investigations have not been analysed or used for surveillance or ongoing prevention research purposes. Our study found that much of the information collected by medical examiners in Nova Scotia varies and as such cannot be fully used to develop a provincially representative, robust surveillance system inclusive of a number of suicide risk factors. There appear to be two key issues with respect to the use of medical examiners' data for suicide surveillance and prevention research: (1) inconsistencies in some of the sociodemographic information collected and recorded *across* files, as well as inconsistencies *within* the files, and (2) significant variations across files in the amount of social, medical/health and other information provided or recorded.

The use of routinely collected data provides a feasible means of surveillance. NSMES records can provide information on all deaths deemed to be due to suicide. Use of a standardized interview instrument or data collection tool in the course of investigations would help ensure completeness of the data. The instrument may include closed-ended questions, which would be useful for populating a research database; however, we recognize that the unique nature of each investigation prohibits the implementation of a single uniform set of closed-ended questions. The resulting comprehensive data set may be used to assist in our understanding of suicide in the population, including the use of common methods and associated sociodemographic factors, as well as to identify opportunities for intervention. Reconstructing the NSMES system to serve this important public health purpose will likely require legislative changes.

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References

1. Peter Nestman; Population Health Research Unit. Suicide and attempted suicide in Nova Scotia (1995-2004): a report [Internet]. Halifax (NS): Department of Health Promotion and Protection; 2009 Feb [cited 2011 Jan 10]. Available from: http://www.gov.ns.ca/hpp/publications/Suicide_Report.pdf

2. Statistics Canada. CANSIM Table 102-4309. Mortality and potential years of life lost, by selected causes of death and sex, three-year average, Canada, provinces, territories, health regions and peer groups, occasional [Internet]. Ottawa (ON): Statistics Canada; [cited 2011 April 18]. Available from: http://www5.statcan.gc.ca/cansim/pick-choisir?lang=eng&searchTypeByValue=1&id=1024309

3. Donaldson AE, Larsen Y, Fullerton-Gleason L, Olson LM. Classifying undetermined poisoning deaths. Inj Prev. 2006;12:338-43.

4. Parai J, Kreiger N, Tomlinson G, Adlaf E. The validity of the certification of manner of death by Ontario coroners. Ann Epidemiol. 2006;16:805-11.

5. Health Canada. A report on mental illnesses in Canada. Ottawa (ON): Health Canada; 2002 Oct [cited 2010 Jul 13]. Available from: http://www.phac-aspc.gc.ca/publicat/miic-mmac/pdf/men_ill_e.pdf

6. Government of Nova Scotia. Office of the Chief Medical Examiner. Halifax (NS): Government of Nova Scotia; [updated 2009 Apr 4; cited 2010 Jul 13]. Available from: http://www.gov.ns.ca/just/CME.asp

7. Government of Nova Scotia. Fatality investigations act, 2001. Halifax (NS): Government of Nova Scotia; 2002 [cited 2010 Jul 13]. Available from: http://www.gov.ns.ca/legislature/legc/statutes/fatalinv.htm

8. Moscicki EK. North American perspectives: epidemiology of suicide. Int Psychogeriatr. 1995;7:137-48.

9. Parrish G. Assessing and improving the quality of data from medical examiners and coroners [Internet]. Atlanta (GA): Centres for Disease Control and Prevention; 1995 [cited 2010 Jul 13]. Available at: http://www.cdc.gov/nchs/data/ice/ice95v1/C25.pdf

10. Isaacs S, Keogh S, Menard C, Hockin J. Suicide in the Northwest Territories: a descriptive review. Chronic Dis Can 1998; 19:152-6.

11. Poulin C, Stein J, Butt J. Surveillance of drug overdose deaths using medical examiner data. Chronic Dis Can. 1998;19:177-82.

12. Snowdon J, Baume P. A study of suicides of older people in Sydney. Int J Geriatr Psychiatry. 2002;17:261-9.

13. Bennewith O, Hawton K, Simkin S, Sutton L, Kapur N, Turnbull P, et al. The usefulness of coroners' data on suicides for providing information relevant to prevention. Suicide Life Threat Behav. 2005;35:607-14.

14. Comstock RD, Mallonee S, Jordan F. A comparison of two surveillance systems for deaths related to violent injury. Inj Prev. 2005;111:58-63.

15. Shields LB, Hunsaker DM, Hunsaker JC 3rd. Suicide: a ten-year retrospective review of Kentucky medical examiner cases. J Forensic Sci. 2005 May;50(3):613-7.

16. Juurlink DN, Mamdani MM, Kopp A, Redelmeier DA. The risk of suicide with selective serotonin reuptake inhibitors in the elderly. Am J Psychiatry. 2006;163:813-21.

17. Sutton L, Hawton K, Simkin S, Turnbull P, Kapur N, Bennewith O, et al. Gunshot suicides in England--a multicentre study based on coroners' records. Soc Psychiatry Psychiatr Epidemiol. 2005 Apr;40:324-8.

18. Hempstead K. The geography of self-injury: spatial patterns in attempted and completed suicide. Soc Sci Med. 2006;62:3186-96.

19. Paulozzi LJ, Mercy J, Frazier L Jr, Annest JL; Centers for Disease Control and Prevention. CDC's National Violent Death Reporting System: background and methodology. Inj Prev. 2004;10:47-52.

20. Sanford C, Marshall SW, Martin SL, Coyne-Beasley T, Waller AE, Cook PJ, et al. Deaths from violence in North Carolina, 2004: how deaths differ in females and males. Inj Prev. 2006 Dec;12 Suppl 2:ii10-ii16.

21. Canadian Red Cross. The facts about drowning in Canada: 2005 edition [Internet]. Ottawa (ON): Canadian Red Cross; 2005 [cited 2010 Oct 20]. Available at: http://www.croixrouge.ca/cmslib/general/drowningreport2005_en.pdf

22. Cheng AT, Chen TH, Chen CC, Jenkins R. Psychosocial and psychiatric risk factors for suicide. Case-control psychological autopsy study. Br J Psychiatry. 2000;177:360-5.

23. Séguin M, Lesage A, Turecki G, Daigle F, Guy A. Research project on deaths by suicide in New Brunswick between April 2002 and May 2003 [Internet]. Montreal (QC): Douglas Mental Health University Institute; 2005 Apr [cited 2010 Jul 13]. Available at: http://www.gnb.ca/0055/pdf/3182_e.pdf

24. Garlow SJ. Age, gender, and ethnicity differences in patterns of cocaine and ethanol use preceding suicide. Am J Psychiatry. 2002 Apr;159:615-9.

25. Langlois S, Morrison P. Suicide deaths and suicide attempts. Health Rep. 2002;13(2): 9-22.

26. Paris J. Predicting and preventing suicide: do we know enough to do either? Harv Rev Psychiatry. 2006;14:233-40.

27. Shields LB, Hunsaker DM, Hunsaker JC 3rd. Adolescent and young adult suicide: a 10-year retrospective review of Kentucky Medical Examiner cases. J Forensic Sci. 2006 Jul;51(4): 874-9.

28. Rowe JL, Bruce ML, Conwell Y. Correlates of suicide among home health care utilizers who died by suicide and community controls. Suicide Life Threat Behav. 2006 Feb;36(1): 65-75.

29. Statistics Canada. 2006 Community Profiles: Halifax, Nova Scotia (Code1209034) (table) [Internet]. Ottawa (ON): Statistics Canada; 2007 [cited 2011 Jan 6]. [Statistics Canada, Catalogue No.: 92-591-XWE]. Available at: http://www12.statcan.ca/census-recensement/2006/dp-pd/prof/92-591/index.cfm?Lang=E

30. Hu G, Wilcox HC, Wissow L, Baker SP. Mid-life suicide: an increasing problem in U.S. whites, 1999-2005. Am J Prev Med. 2008; 35:589-93.

31. Qin P, Agerbo E, Mortensen PB. Suicide risk in relation to socioeconomic, demographic, psychiatric, and familial factors: a national register-based study of all suicides in Denmark, 1981-1997. Am J Psychiatry. 2003; 160:765-72.

32. Chan WS, Yip PS, Wong PW, Chen EY. Suicide and unemployment: what are the missing links? Arch Suicide Res. 2007;11: 327-35.

33. Rush B, Koegl CJ. Prevalence and profile of people with co-occurring mental and substance use disorders within a comprehensive mental health system. Can J Psychiatry. 2008;53:810-21.

34. Stack S, Wasserman I. Economic strain and suicide risk: a qualitative analysis. Suicide Life Threat Behav. 2007;37:103-12.

35. Statistics Canada. Canadian Coroner and Medical Examiner Database (CCMED). Ottawa (ON): Statistics Canada; [modified 2009 Dec 16; cited 2010 Jul 13]. Available at: http://www.statcan.gc.ca/cgi-bin/imdb/p2SV.pl?Function=getSurvey&SDDS=5125&lang=en&db=imdb&adm=8&dis=2

Cross-Canada Forum

Online resources to enhance decision-making in public health

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Introduction

A virtual front door, the Canadian Best Practices Portal for Health Promotion and Chronic Disease Prevention ("the Portal") provides access to evaluated community and population health interventions relevant to chronic disease prevention and health promotion.[1] Designed to help Canadian public health practitioners and decision makers identify suitable interventions that they can adapt and replicate to meet their needs, the Portal is a highly accessible, easy to use and dynamic.[1] It has a flexible search function and is supported by an extensive array of resources to inform policy and practice.[1]

Launched in 2006, the Portal forms a central pillar of the Canadian Best Practices Initiative, which was established by the Public Health Agency of Canada (PHAC) to improve policy and program decision-making by enabling access to the best available evidence on chronic disease prevention and health promotion practices.[1] Throughout each phase of the Portal's development, more and more current public health topics and new decision-making tools have been added. As of February 2011, the Portal provides information on about 357 interventions and access to 58 resources.

In this article, we aim to demonstrate the unique role of the Portal within the broader context of other available online resources. We use the concept of a "pyramid of evidence"[2] to compare the Portal with one specific resource, Health-evidence.ca, to illustrate how public health practitioners and decision makers can use these resources together to make better, more evidence-informed decisions.

Evidence-informed decision-making within the public health sector in Canada

A key recommendation of the final report of the National Forum on Health, *Canada Health Action: Building on the Legacy*, was to develop an evidence-informed health care system where high quality research influences policies and clinical decisions.[3] Since then, there has been a significant effort to promote evidence-informed health practices and to establish resources for knowledge transfer in both the clinical and the health promotion settings.

Nevertheless, the public health sector in Canada still faces significant barriers to making evidence-informed decisions.[4] Obstacles include individual barriers, such as lack of time and skill; organizational barriers, such as a lack of human resources; no clearly communicated values for evidence-informed decision-making (EIDM); lack of input from all levels of the organization; lack of leadership and champions; and inadequate resources and infrastructure to promote and support EIDM.[4] Decision makers also have an ongoing need for better access to systematic reviews so that their decisions are relevant and applicable to the "real world" practice setting.[5]

Improving the process of evidence-informed decision-making

The process of EIDM involves translating the best available evidence from a "systematically collected, appraised, and analyzed body of knowledge"[6] in a four-step process described by Robeson et al. as follows:

> "1) clearly articulating a practice-based issue; 2) searching for and accessing relevant evidence; 3) appraising methodological rigour and choosing the most synthesized evidence of the highest quality and relevance to the practice issue and setting that is available; and 4) extracting, interpreting, and translating knowledge, in light of the local context and resources, into practice, program and policy decisions."[4]

While the need to address the individual and organizational barriers to advancing and sustaining EIDM remains,[4] a recent proliferation of online resources provides decision makers with a range of high quality research. For example, PHAC also launched the Canadian Taskforce on Preventive Health Care to develop clinical practice guidelines that support primary care providers in delivering the best possible preventive health care.[7] Other Canadian sites include Health-Evidence.ca, which is partly funded by PHAC, as well as the Public Health Plus website* from the National Collaborating Centre for Methods and Tools.[8] Other sites include the Guide to Community Preventive Services website† from the Centers for Disease Con-trol and Prevention, Cancer Control P.L.A.N.E.T.‡ and The Cochrane Library.§ Each of these offers different categorizations and levels of evidence on effective public health practice, with various focal points.

* http://www.nccmt.ca/tools/public_health_plus-eng.html

† http://www.thecommunityguide.org/index.html

‡ http://cancercontrolplanet.cancer.gov/

§ http://www.thecochranelibrary.com/view/0/index.html

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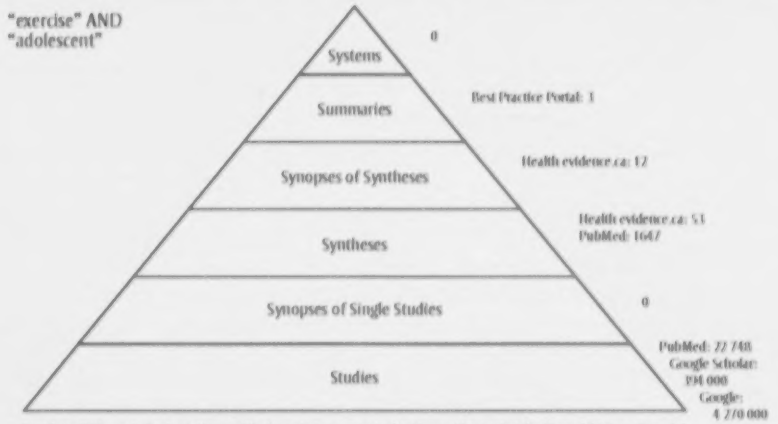
Several are searchable databases that provide a wide range of information and often require training in search techniques. As a result, they can be daunting to those with limited time and expertise.

Dicenso et al. proposed a pyramid of pre-processed research evidence that can reduce the time spent finding synthesized research evidence to inform policy and practice.[2] The shape encourages the search for evidence to begin at the top of the pyramid. This holds the most synthesized evidence whereas the bottom holds evidence in its most raw form. Many users generally start their search the other way around, with the most raw information, which can be very overwhelming. In many cases, they stumble upon more highly synthesized evidence only by chance.[4]

Figure 1 shows DiCenso's pyramid of evidence using the example of a search focused on the issue of exercise and adolescents.

FIGURE 1
A pyramid of pre-processed research evidence focused on the issue of exercise and adolescents



Based on: DiCenso A, Bayley L, Haynes RB. Accessing pre-appraised evidence: Fine-tuning the 5S model into a 6S model. Evid Based Nurs. 2009; 12:99-101.

The Canadian Best Practices Portal

The Canadian Best Practices Initiative[1] was the outcome of five years of Health Canada-funded work by Michael Goodstadt and Barbara Kahan at the University of Toronto. Their work led to the development of the Interactive Domain Model (IDM) Best Practices[¶] and, ultimately, the Canadian Best Practice System for Chronic Disease Prevention and Control.[9]

The Canadian Best Practices Portal was born of these initiatives. Its key purpose is, quite simply, "to help public health decision-makers make better decisions." The Portal is built upon the population-health approach, which recognizes that health is a capacity or resource rather than a state, a definition that corresponds more to the notion of being able to pursue one's goals, to acquire skills and education, and to grow. This broader notion of health recognizes the range of social, economic and physical environmental factors that contribute to health. The best articulation of this concept of health is "the capacity of people to adapt to, respond to, or control life's challenges and changes."[10]

Over the years, the Portal has steadily grown to include more current public health topics and new decision-making tools. Its search function is designed to help public health decision-makers identify interventions that meet their particular needs.

Key features of the Canadian Best Practices Portal

The Portal includes a searchable database of evaluated community and population health interventions that can be replicated and adapted for use in similar fields. This can be a real time-saver for program and policy development and evaluation. Acting as a single point of access to evidence-informed best practices, the Portal makes public health planning easier and more efficient. Interventions are categorized by chronic disease/condition, health promotion topics, behaviour-related risk, strategy, population, determinants of health, country of origin and language. Searches can combine any of these categories and can be further narrowed by setting or by keywords. The information on interventions is well organized and easy to use. In the case where two or more interventions could be applicable, definitions described in a hierarchy of evidence[11] help users assess both qualitative and quantitative research evidence.

The interventions included in the Portal have all been consistently and rigorously screened through a comprehensive set of selection criteria that consists of six key steps:

1. Literature and collection search by priority topic;
2. Assessment of quality of evaluation or study design;
3. Search for additional information on selected individual interventions;
4. Expert review using inclusion criteria;
5. Prioritization of selected interventions for annotation; and
6. Selection of resources.

This intensive screening process ensures that Portal content is made up of best practices (supported by systematic reviews and experimental designs) and promising practices (supported by quasi-experimental design and/or observational studies). However, it is important to note that the scientific quality of evidence in the Portal varies due to differences in the evaluation approaches used by the interventions.[12] (More information on the selection and screening process is available elsewhere.[13])

¶ http://www.idmbestpractices.ca/idm.php

The Portal also includes a selection of resources that help practitioners reach their public health planning, chronic disease prevention and health promotion goals. The resources—websites, documents, systematic reviews, databases, manuals and online tutorials—have been selected based on their specific ability to assist Portal users in making evidence-informed decisions. They are organized according to the National Collaborating Centre for Methods and Tools' seven steps of evidence-informed public health.[14]

Health-evidence.ca

Dr. Maureen Dobbins at McMaster University established the Health-evidence.ca project to promote ongoing collaboration between the research community and the decision-making and practice setting. This initial goal evolved over the years to include an emphasis on facilitating the adoption and implementation of effective policies/programs/interventions at the local and regional public health decision-making levels across Canada.[15]

Health-evidence.ca is provided at no cost to users; despite that, it exists without any permanent funding and has received funding from a variety of agencies.[15] It offers a searchable online registry of systematic reviews about the effectiveness of public health and health promotion interventions. The registry is one part of a much larger and more comprehensive knowledge transfer and exchange site that will support users in accessing and interpreting research evidence. This approach connects users across Canada (and internationally) who work in similar areas or have similar interests.[15]

Key features of Health-evidence.ca

Users of Health-evidence.ca are able to manage and tailor the information they receive to their particular areas of interest. Usability is also enhanced by a searchable registry that recognizes commonly used public health and health promotion terms and categories (e.g. focus of the intervention, intervention strategy, intervention location, and target population).[15]

FIGURE 2
Results of a Canadian Best Practices Portal search on exercise programs for adolescents

Title	Intervention Characteristics	Evaluation Methodology/Design
Jump Into Action		Quantitative
The Fourth R: Skills for Youth relationships		Quantitative
Youth Fit for Life (RTIPS)		Quantitative

The reviews provided by Health-evidence.ca have been assessed using a rigorous process that includes an examination of methodological quality and ratings by two independent reviewers. Users are able to sort search results by the level of review quality (e.g. strong, moderate, or weak). Built-in feedback links also request input on how to improve the site.[15]

What is the difference between the Portal and Health-evidence.ca?

The key difference between the Portal and Health-evidence.ca is that the former provides more information about actual interventions and resources while the latter focuses on the effectiveness of interventions and presents only pre-appraised and pre-synthesized information via systematic reviews.

DiCenso's pyramid of evidence identifies resources at six levels of evidence. In general, resources provided by the Portal fall within the category of "syntheses" or "studies."[7] (see Figure 1). In contrast, Health-evidence.ca's resources can be categorized as "syntheses" that combine (using explicit and rigorous methods) the results of multiple single studies to provide a single set of findings, with some "synopses of syntheses."[7]

Resources from the Portal are pre-screened to meet certain inclusion criteria, and resources from Health-evidence.ca are both pre-screened and pre-appraised (filtered to include only those studies of the best quality). Both these sources are also updated regularly so that the evidence is current.

The services and information provided through Health-evidence.ca overlap with those of the Portal, in that both focus on health promotion. However, Health-evidence.ca also addresses broader public health issues, such as immunization and emergency preparedness.[16]

How decision-makers can make the most of the Portal and other online resources such as Health-evidence.ca

By partnering with Health-evidence.ca, Portal searches are now supported by published systematic reviews that evaluate the effectiveness of public health interventions. Systematic reviews synthesize all the research that exists about an intervention and provide a much better understanding of the effectiveness of an intervention than do single studies.

Consider the example of a busy local public health planner who is charged with developing an exercise program for adolescents. An initial step would be to seek other, relevant programs that might be adapted, thereby saving valuable time and resources. Most planners would probably begin looking for information by conducting a web search. However, the terms "exercise" and "adolescent," for example, would generate 4 270 000 hits using the Google search engine, 394 000 hits using the Google Scholar search engine and 22 748 hits using the PubMed database. It is quite likely that this amount of information would be both overwhelming and extremely discouraging.

In contrast, using Health-evidence.ca as a starting point, the same terms ("exercise" and "adolescent") lead to 102 articles that can be sorted according to their date of publication or strength of evidence. Alternatively, consulting the Portal produces the list of programs/intervention shown in Figure 2.

Let's say that the planner decides to investigate "Jump into Action." Clicking on the intervention title opens a page that provides a description of the program, a link to the intervention site, additional web

links, and other details such as country of origin, evaluation design, language and the primary source document. Following this process, the planner efficiently finds 15 high quality resources that increase the potential of developing a better quality, more targeted intervention.

Conclusion

There are many important contextual factors to consider when planning programs for health promotion and chronic disease prevention, such as the breadth of research support, the applicability of the evidence in a variety of settings, political and economic factors, and the general feasibility of the intervention.[11] However, above all, front-line health practitioners and decision makers working in public health need efficient and easy access to good quality information to enable better, more informed decisions about the services and programs they offer.

Although planners appreciate its importance, many are daunted by the process of analyzing and reviewing evidence to ensure that the programs they study are effective. Fortunately, Canadian planners can use a variety of resources that offer access to public health reviews and interventions. By using a hierarchical pyramid-of-evidence approach, planners can quickly access the high quality evidence needed to build the best possible programs.

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References

1. About the Canadian Best Practices Portal [Internet]. Ottawa (ON): Public Health Agency of Canada; [cited 2011 Apr 26]. Available from: http://cbpp-pcpe.phac-aspc.gc.ca/about/portal-eng.html

2. DiCenso A, Bayley L, Haynes RB. Accessing pre-appraised evidence: Fine-tuning the 5S model into a 6S model. Evid Based Nurs. 2009;12:99-101.

3. National Forum on Health. Canada health action: building on the legacy - Volume 1 - The final report [Internet]. Ottawa (ON): Health Canada; 1997 [cited 2011 Apr 26]. Available from: http://www.hc-sc.gc.ca/hcs-sss/pubs/renewal-renouv/1997-nfoh-fnss-v1/index-eng.php

4. Robeson P, Dobbins M, DeCorby K, Tirilis D. Facilitating access to pre-processed research evidence in public health [Internet]. BMC Public Health. 2010 [cited 2011 Apr 26];10:95. Available from: http://www.biomedcentral.com/content/pdf/1471-2458-10-95.pdf

5. Dobbins M, Jack S, Thomas H, Kothari A. Public health decision-makers' informational needs and preferences for receiving research evidence [Internet]. Worldviews Evid Based Nurs. 2007 [cited 2011 Apr 26];4(3):156-63. Available from: http://health-evidence.ca/downloads/Dobbins2007Public-Health-Decision-Makers-Informational-Needs.pdf

6. Brownson RC, Fielding JE, Maylahn CM. Evidence-based public health: a fundamental concept for public health practice. Annu Rev Public Health. 2009;30:175-201.

7. Canadian Task Force on Preventive Health Care. [Internet]. Ottawa (ON): Public Health Agency of Canada; 2011 [cited 2011 Apr 26]. Available from: http://www.canadiantaskforce.ca/index.html

8. Welcome to National Collaborating Centre for Methods and Tools [Internet]. Hamilton (ON): National Collaborating Centre for Methods and Tools; [cited 2011 Apr 26]. Available from: http://www.nccmt.ca/index-eng.html

9. Public Health Agency of Canada. Population health in Canada: a working paper [Internet]. Ottawa (ON): PHAC; 2001 [cited 2011 Apr 26]. Available from: http://www.phac-aspc.gc.ca/ph-sp/docs/social-sociale/define-eng.php

10. Frankish CJ, Green LW, Ratner P A, Chomik T, Larsen C. Health impact assessment as a tool for health promotion and population health. (1996) Report for Health Canada: Ottawa.

11. Jackson SF, Fazal N, Giesbrecht N. A hierarchy of evidence: which intervention has the strongest evidence of effectiveness? [Internet]. Ottawa (ON): Public Health Agency of Canada; 2008 [cited 2011 Apr 26]. Available from: http://cbpp-pcpe.phac-aspc.gc.ca/pubs/hierarchy-of-evidence.pdf

12. Dubois N, Jetha N, Robinson K, Szuto I, Wan G, Wilkerson T. Canadian Best Practices Initiative methodology background paper [Internet]. Ottawa (ON): Public Health Agency of Canada; 2008 [cited 2011 Apr 26]. Available from: http://cbpp-pcpe.phac-aspc.gc.ca/pubs/CBPI-methodology.pdf

13. Understanding how interventions are chosen: summary of search, selection and inclusion process and criteria. [Internet]. Ontario (ON): Public Health Agency of Canada; [cited 2011 Apr 26]. Available from: http://cbpp-pcpe.phac-aspc.gc.ca/selection-eng.html

14. National Collaborating Centre for Methods and Tools. Evidence-informed public health: [Internet]. Hamilton (ON): National Collaborating Centre for Methods and Tools; 2009 [cited 2011 Apr 26]. Available from: http://www.nccmt.ca/eiph/index-eng.html

15. Health-evidence.ca. About Us. [Internet]. Hamilton (ON): McMaster University; c2003 [cited 2011 Apr 26]. Available from: http://health-evidence.ca/html/AboutUs

16. Daghofer D. The value-added investment of the Canadian Best Practices Portal to the Public Health Agency of Canada. Ottawa (ON): Public Health Agency of Canada; 2008.

Workshop report

International roundtable on the self-management support of chronic conditions

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Abstract

An international roundtable on self-management support (SMS) for persons living with chronic conditions (CCs) was held in Vancouver, Canada, in June 2009. It brought together 23 leading researchers, policy makers, health care practitioners and consumers from Canada, Australia, New Zealand, the United Kingdom and the United States. It also provided a forum for critically reflecting on SMS approaches and for building consensus on how to move forward in the self-management field. The deliberations resulted in a draft international framework that identifies key definitions, principles and strategic directions and also outlines sample strategies to guide those working to develop SMS capacities at the local, regional or national level. The framework is a mechanism for knowledge exchange that will hopefully act as a catalyst to shift SMS-related policy, practice and research directions to better serve the needs of all CC populations. More than 400 multi-level stakeholders in the Canadian and international community have been invited to review the framework using an e-consultation process. The final framework is scheduled for release in the late fall of 2011.

Keywords: self-management, chronic disease, chronic conditions, health policy, health care reform, international collaboration, framework

Introduction

Self-management support (SMS) has become an integral component of the management of chronic conditions (CCs) and has been promoted as an important part of the solution to the individual, social and economic consequences of CCs.[1-4] As an essential component of the Chronic Care Model,[5] SMS activities have also become an important consideration in many health care reforms. Self-management includes the tasks that individuals engage in to manage their symptoms and treatments and the physical, emotional and social consequences of living with CCs everyday.[6] SMS, on the other hand, is the broader domain of activities provided by people, organizations and systems to support and increase people's ability to self-manage their CCs. SMS includes infrastructures and policies, supportive services and programs, and skills, resources and social networks.[7,8]

A number of governments, health authorities, health care facilities, professional associations and non-profit organizations are promoting initiatives in SMS-related research, policies and programs to help reduce the various impacts of illnesses such as arthritis, diabetes, heart disease, multiple sclerosis, depression and HIV/AIDS. In Canada, SMS activities are developing at local, regional, provincial and national levels. These include an environmental scan of Canadian-based CC SMS activities funded by the Public Health Agency of Canada[9] as well as efforts to improve primary health care delivery (i.e. family health teams) to better align SMS activities with the needs of the CC population.[9,10]

However, the development of new models and innovative approaches raises questions on the complex issue of the quality and effectiveness of programs, engagement of health care providers, integration with primary care, community participation in program development, potential harms and benefits of certain programs, and the limitations of some individuals to effectively self-manage their conditions. Gaps exist in integrating knowledge about self-management across fields of research; for example, the vast amount of qualitative literature on how people manage their CCs has not been well integrated with the literature and research on self-management. Similarly, knowledge on self-management from critical and social perspectives in medical sociology and related fields has largely *not* been incorporated into the body of literature on self-management. Gaps also exist in the exchange of knowledge and information between research, policy, and practice domains. For example, while there is mixed evidence on the effectiveness[6,11,12] of the Stanford Chronic Disease Self-management Program,[14] it remains the dominant policy approach being implemented in many

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provinces in Canada.[9] There is also increasing concern that mainstream approaches to SMS may be meeting the needs of certain subgroups of the CC population, namely largely white, well-educated persons, to the exclusion of other disadvantaged groups and that this may be increasing inequities.[9,15,23]

These challenges in SMS have been discussed at international seminars and conferences over the past few years.[24,25] However, there remained a well-recognized need to convene a meeting dedicated to better understanding these issues and gaps and to use expert opinion and knowledge to develop a collective vision of how to address these challenges. As a result, an international roundtable on the SMS of CCs was held in Vancouver in June 2009.

International roundtable and consultation

The British Columbia Centre of Excellence for Women's Health hosted a three-day international roundtable on the SMS of CCs, entitled "'Minding the Gap': Building a Frame-work to Bridge Evidence, Policy, and Practice in Self-Management Support for People with Chronic Conditions." The roundtable, with Canada playing a leadership role, brought together international and interdisciplinary expertise in self-management from among leading researchers, policy makers, health care professionals and consumers from Australia, New Zealand, the United Kingdom and the United States as well as Canada. The 23 participants explored major initiatives in the current SMS field, identified key stakeholder perspectives and needs, analyzed strengths and opportunities and began developing a vision for advancing the field. The three-day process saw important differences in perspectives as well as divergent opinions and tensions between individuals, disciplines, sectors and countries; these high-lighted the challenges and opportunities of collaborative initiatives involving multiple countries and stakeholders at different levels. The self-administrated survey responses of 12 expert informants who were not present at the roundtable (including two health professionals working in Canada's First Nations communities) added further opinions to the exciting debates.

The roundtable achieved its goal of furthering an interdisciplinary and intersectoral understanding of SMS and created a collaborative space for advancing SMS research, policy and practice. The participants were able to articulate a list of key values, principles, strategic directions and actions for addressing major gaps; these recommendations were summarized in a proceedings report.[27] The participants agreed that ongoing collaboration across sectors and disciplines and within and among countries was essential to disseminate evidence-based practices and evidence-informed policy. In order to continue the collaboration process initiated at the meeting, participants developed a plan to create an "SMS community of practice." The Canadian Institutes of Health Research (CIHR), which co-funded the roundtable, awarded a grant in January 2010 to further advance the development of the framework and community of practice.

Forwarding the field: international SMS framework development

After the meeting, transcripts were compiled and analyzed using qualitative methods (thematic analysis) and the findings were used in the framework development process[28] to create *Building Bridges: An International Framework for Chronic Condition Self-Management Support* ("CCSMS framework"). This draft framework was sent out for two reviews among the roundtable participants in April and September 2010 using a modified Delphi e-consultation process[29] (using a web-based survey created using SurveyMonkey) resulting in an 82% and 80% response rate, respectively. In December 2010, the framework was released via an adapted e-survey to more than 400 individuals and organizations in the SMS field for broad international review. In total, over 203 reviewers from 16 countries reviewed and gave their feedback on the draft framework: 194 completed the e-survey, and 9 gave detailed responses through email. The final framework will be broadly disseminated in the late fall of 2011. In order to strengthen the potential utility and impact of the framework over the long term, supplementary documents may be developed; these will focus on evidence to support the identified strategic directions, implementation approaches in different contexts, and tools to facilitate knowledge translation between re-search, policy and practice.

The purpose of the draft framework is to help stakeholders in a variety of sectors influence policy, practice and research related to SMS for CCs. The framework identifies eight principles and seven strategic directions to guide those working to develop SMS capacities at the local, regional and national level. It also identifies sample strategies that suggest different ways of addressing each key area, recognizing that specific strategies must be developed in response to the needs, res-ources and systems in specific contexts.

Conclusion

As a result of its key involvement in the CCSMS framework, Canada is situated as a leader in building bridges, facilitating the development of a collective vision that can improve SMS. The collaborative process of developing the framework that began in Vancouver in 2009 has been instrumental in creating an international SMS community of practice that can continue to exchange knowledge and experience across countries and embark on mutually beneficial projects that aim to improve the health of CC populations and reduce inequities. As evidenced by the positive survey responses to date, the draft CCSMS framework is already acting as an important catalyst for expanding and strengthening research, policy and practice networks and knowledge translation capacities both in Canada and abroad.

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References

1. Bourbeau J, Collet JP, Schwartzman K, Ducruet T, Nault D, Bradley C. Economic benefits of self management education in COPD. Chest. 2006;130(6):1704 11.

2. Holman H, Lorig K. Patient self management: a key to effectiveness and efficiency in care of chronic disease. Public Health Rep. 2004;119:239 43.

3. Bury M, Pink D. The HSJ debate. Self management of chronic disease doesn't work. Health Serv J. 2005;115(5947):18 9.

4. Rogers A, Kennedy A, Bower P, Gardner C, Gately C, Lee V, et al. The United Kingdom Expert Patients Programme: results and implications from a national evaluation. Med J Aust. 2008;189(10):S21 S4.

5. Wagner EH. Chronic disease management: what will it take to improve care for chronic illness? Eff Clin Pract. 1998;1:2 4.

6. Barlow J, Wright C, Sheasby J, Turner A, Hainsworth J. Self management approaches for people with chronic conditions: a review. Patient Educ Couns. 2002;48(2):177 87.

7. Institute of Medicine (IOM). Priority areas for national action: transforming health care quality. In Adams K, Corrigan JM, editors. Washington (DC): National Academy Press; 2003.

8. Mills S, Brady TJ, Sargious P, Ziabakhsh S, Jayanthan J. Building bridges: an international framework for promoting self management support in the care of chronic conditions. Vancouver (BC): The Chronic Conditions Self Management Support (CCSMS) Framework and Community of Practice Project Team; Forthcoming 2011.

9. Paterson B, Kealey L, MacKinnon R, McGibbon C, Van den Hoonaard D, LaChapelle D. Chronic diseases self management practice in Canada: patterns, trends and programs; 2009.

10. McGowan P. The chronic disease self management program in British Columbia. In: Dorland J, McColl MA, editors. Emerging approaches to chronic disease management in primary health care. Montreal (QC): McGill Queen's University Press; 2006. p. 79 90.

11. British Columbia Ministry of Health. Primary health care charter: a collaborative approach. 2007 [cited 2009 September 21]; Available from: http://www.health.gov.bc.ca/library/publications/year/2007/phc_charter.pdf

12. Wright CC, Barlow JH, Turner AP. Self management training for people with chronic disease: an exploratory study. Br J Health Psychol. 2003;8:464 76.

13. Foster G, Taylor SJ, Eldridge SE, Ramsay J, Griffiths CJ. Self management education programmes by lay leaders for people with chronic conditions. Cochrane Database of Syst Rev. 2007(4):CD005108.

14. Lorig K, Holman HR, Sobel D, Laurent D, González V, Minor M, et al. Living a healthy life with chronic conditions, Canadian edition, 3rd ed. For ongoing physical and mental health conditions. Boulder (CO): Bull Publishing Company 2007.

15. Foster M, Kendall E, Dickson P, Chaboyer W, Hunter B, Gee T. Participation and chronic disease self management: are we risking inequitable resource allocation? Aust J Prim Health. 2003;9(3):132 40.

16. Rogers A, Kennedy A, Nelson E, Robinson A. Uncovering the limits of patient centredness: implementing a self management trial for chronic illness. Qual Health Res. 2005;15(2):224 39.

17. Anderson JM. Speaking of illness: issues of first generation Canadian women implications for patient education and counseling. Patient Educ Couns. 1998;33(3):197 207.

18. Bluestein J, Valentine M, Mead H, Regenstein M. Race/Ethnicity and patient confidence to self manage cardiovascular disease. Med Care. 2008;46(9):924 9.

19. Boddy D, Sills E. Chronic disease self management by people from lower socio economic backgrounds: action planning and impact. J Integrat Care. 2006;14(4):19 25.

20. Lindsay S. How and why the motivation and skill to self manage coronary heart disease are socially unequal. Res Sociol Health Care. 2008;26:17 39.

21. Oster NV, Welch V, Schild L, Gazmararian JA, Rask K, Spettell C. Differences in self management behaviours and use of preventive services among diabetes management enrollees by race and ethnicity. Disease Management. 2006;9(3):167 75.

22. Raphael D, Anstice S, Raine K, McGannon KR, Rizvi SK, Yu V. The social determinants of the incidence and management of type 2 diabetes mellitus: are we prepared to rethink our questions and redirect our research activities? Leadersh Health Serv. 2005;16(3):10 20.

23. Villaire M, Mayer G. Low health literacy: the impact on chronic illness management. Prof Case Manage. 2007;12(4):213-6.

24. Ackerman I, Chan B, Springer A, Buchbinder R, Osborne RH. Who is capable, willing and able to participate in arthritis self-management programs? Paper presented at: International congress on CDSM; 2008. University of Melbourne, Australia.

25. Chu M, Liu K, Hong Y. Chronic disease self-management in Chinese community. Paper presented at: Global perspectives on chronic disease: prevention and management conference; 2007. Calgary (AB), Canada.

26. McDonald J, Harris E. Self-management in disadvantaged communities: A review of the evidence. Workshop on implementing chronic disease self-management in health care. 2007. Sydney, Australia.

27. Mills S, Osborne RH, Brady TJ, Rogers AE, Vanden E. The International Roundtable on the Self-Management of Chronic Conditions Summary Report. 'Minding the gap': building a framework to bridge evidence, policy and practice in self-management support for people with chronic conditions. BC Centre of Excellence for Women's Health. September 2009.

28. Mills S, Jayanthan J, Seaborn E. Building common ground: developing an international framework for bridging evidence, policy and practice in self-management support of chronic conditions. Health Issues. Autumn 2011; 106: 13-14.

29. Thomson R, Lewalle P, Sherman H, Hibbert P, Runciman W, Castro G. Towards an international classification for patient safety: a Delphi survey. Int J Qual Health Care. 2009;21(1):9-17.

Book review

Concepts of Epidemiology: Integrating the Ideas, Theories, Principles and Methods of Epidemiology

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Authors: Raj Bhopal
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Disappointed with the texts used to teach introductory epidemiology to postgraduate students, Bhopal published his own book based on a review of 25 introductory texts in 2002.[1] In that well-received first edition, Bhopal explained the underpinning concepts of epidemiology using plain language and illustrative examples; he further aimed to reinforce understanding by including practice questions and answers at the end of each chapter.

The primary aim of this second edition was to improve upon the first in several areas. In contrast to the first edition, the author has expanded the question and answer sections and further simplified the language to accommodate those students whose main language is not English. He has also added introductions to particular fields, including genetic epidemiology and the purpose of reviews (narrative, systematic and meta-analysis).

As with the first edition, this 417-page second edition is divided into 10 chapters designed to be taught in 10-day introductory course at the postgraduate level. As a whole, the book explains the key concepts in epidemiology well and provides a background to a broader conceptual framework. At the start, we are introduced to the idea that the underlying premise of epidemiology asks us to consider why some people in a population are healthier than others; through an examination of the myriad determinants of health, practitioners in multiple disciplines can put into practice what they know in order to improve the health of populations. Here the book would benefit from a population health framework diagram to show the different levels of factors that contribute to population health. An example of such a framework is the CIHR-IPPH Conceptual Framework of Population Health.[2]

The section on relative risk, odds ratios and attributable risk is well explained so that the reader can clearly understand the concepts of each measure and be able to calculate them accurately. The sample questions provide reinforcement of the concepts and their applications. Students will also find useful the glossary of terms although some important epidemiological terms, including "reliability" and "validity," are missing.

For the most part, the material presented in the text is valid and well summarized and reported on. There are certain concepts, however, that require more accurate explanation. For example, Bhopal refers to "the epidemiological concept of sex [as] also a mix of biological and social" (p.9); it is more accurate to describe "sex" as the biological concept and "gender" as the social one. Similarly, he does not distinguish between "race" and "ethnicity." In some parts of the book, concepts are introduced too generally, such as the overview of study designs in table format, which seems out of place. This may confuse students since overview tables are generally more useful after a detailed explanation. Further, the relationship between variables and outcomes could have been more clearly explained using diagrams.

The section "How to keep your supervisor happy; or 9 tips on research writing" (p. 345) seems out of place being as it is in the chapter "Epidemiological study design and principles of data analysis." The section is headed "Appendix 2," which makes one think that it was intended for the back of the book, where it would be better placed. Also at the back of the book is the section on historical landmarks in epidemiology, which is traditionally placed at the beginning of epidemiology texts. The account of John Snow and the infamous Broad Street pump, for example, which resulted in his concluding that cholera was water-borne and not the result of "miasma," is buried so far in the back of the book that it risks being overlooked altogether.

The discussion regarding population homogeneity and heterogeneity in the exploration of causes of disease (p.24) is quite strong, as is the section on research ethics. The social determinants of health are well described, particularly the discussion on income gradients and impact of societal factors on health. The concept of Rose's "causes of causes," which is not often discussed in introductory texts, is well explained and useful in the discussion of the determinants of health and complexity in the study of population health. Also, the section on genetic epidemiology is clearly written, making use of good examples to illustrate some of the more difficult concepts.

Overall, the book uses language suitable for students with an intermediate level of English. It contributes to other works on the subject, especially the conceptual frameworks and theories that are the basis of epidemiology and many of the analytical approaches to which health researchers sometimes do not give enough consideration. Although there are some sections that could be im-proved upon, in general this second edition of *Concepts of Epidemiology* is one of the more comprehensive and effective texts for teaching introductory epidemiology to graduate students.

References

1. Bhopal R. Which book? A comparative review of 25 introductory epidemiology text books. J Epidemiol Community Health. 1997; 51(6):612-22.

2. Etches V, Frank J, Di Ruggiero E, Manuel M. Measuring population health: a review of indicators. Annu Rev Public Health. 2006;27: 29-55.

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